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MONTANA CONSERVATION STUDY: BIKEWAYS

Prepared for

THE MONTANA ENERGY OFFICE

by

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MONTANA ENERGY CONSERVATION STUDY: BIKEWAYS

INTRODUCTION

The world, including the United States, is facing some major shifts in energy utilization patterns, particularly for petroleum-based products. This is being brought about by general worldwide increases in energy demand without an associated equal or greater increase in the supply of oil. People speak of the "energy crisis" as though it were a problem of relatively short duration; however, it is very apparent that beyond the immediate crisis involving worldwide oil shortages, there is an energy consumption problem that is changing our life styles for the future.

The energy consumption for the transportation segment of our society consumes approximately 25% of all energy, nationally. In the State of Montana, with its vast distances and scattered population, energy consumption for transportation equals 31% of all energy used in the State. Therefore, in any plan designed to effectively impact the over-all energy consumption in the State of Montana, conservation

of energy utilization in the transportation sector must be considered.

In the Montana Energy Conservation Plan of 1977, revised January, 1978, one of the program measures within the transportation sector was bikeway construction. The development and utilization of bikeways in the communities of Montana not only could serve to conserve fuel but could also provide a less expensive mode of transportation which is often more convenient--particularly for short trips--and usually more healthful, both from an exercise standpoint and from the reduction of pollutants resulting from the combustion of gasoline in automobile engines.

The use of bicycles as a general mode of transportation in the United States is under-utilized, not only in relation to its potential but also in relation to the level of use experienced in many other developed nations of the world.

Historically, bicycles have been used during periods of depression and wars as an effective means of low-cost transportation and as a means of conserving fuel. Figures from the National Recreation and Park Association indicate that sales of bicycles in the United States exceeded that of automobiles in the early 1970's. It has been estimated that approximately half of the people in the United States are bicycle riders and that about 30% of the population in a given area are active bicyclists. This is a relatively high percentage when one considers the dearth of adequate and safe bikeways, generally, throughout the United States. It must be recognized that the potential use of bicycles as a viable means of transportation depends not only upon



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the availability of bikeways but also upon the general terrain--whether flat or hilly--and upon climatic factors.

In any program designed to increase the use of bicycles as a means of personal transportation and thereby conserve fuel, it is necessary to develop adequate bikeways for use by cyclists. One of the immediate goals cited in Program Measure 5b: Bikeway Construction, of the Montana Energy Conservation Plan, is the development of bikeways and, in particular, to facilitate efforts by the local governments to design and implement bikeway systems, to document existing bikeway programs, and to assess the amount of energy savings which could be realized from such a program.

STATEMENT OF PURPOSE

The purpose of this project was to determine the demand and/or need for expanded bikeway facilities in Montana's thirteen largest urban areas, including the estimated usage by motivation of trip generation; document current bikeway plans in the thirteen largest urban areas of Montana; and to compute attainable decreases in consumption of petroleum products due to an expanded bikeway program.

STUDY DESIGN

In order to gather the information necessary to determine the demand and need for bikeway facilities in Montana cities and to assess the potential savings, it was necessary to:

- (1) Identify and examine the related information, particularly in reference to fuel saving computations, requirements for developing bikeways, and deterrents to the utilization of bicycles for personal transportation purposes;
- (2) Assess the opinions of Montana drivers in each of the thirteen urban areas of the State relative to their views of the use of bicycles as a viable means of personal transportation; and
- (3) Document the current bikeway plans in Montana's thirteen largest urban areas.

The search for related information for this study was accomplished by means of a computer search of the files in the Oakridge National Laboratory in Oakridge, Tennessee, which maintains a current listing of publications in the particular area in question. This computer search was supplemented by research in local libraries.

The views of Montana drivers were assessed by means of a public opinion poll administered by interviewers in each of the thirteen largest cities of the State. Because a companion study concerning the use of the Montana "right turn on red" law was being conducted simultaneously, and because that study called for a questionnaire assessment of Montana driver attitudes, it was decided to combine the public opinion poll of the two studies and, thereby, expand the sample possible for each study and, hence, improve the quality of the statistics. Therefore, a combined questionnaire was developed and tested.

Two persons were selected as interviewers; were trained in the assessment requirements and interviewing procedures; and then traveled to each of the thirteen cities, in turn, to conduct the interviews and record the responses of Montana drivers. The technique of randomizing responses used was to solicit the opinions of Montana drivers in the vicinity of shopping malls and other places where the public gathers in each of the cities. Because this study focuses upon potential savings in energy due to the substitution of bicycle transportation for automobile transportation, only the opinions of Montana drivers were solicited in the interviews.

The documentation of current bikeway plans in the thirteen urban areas was accomplished by writing individual letters to community officials in each of the cities soliciting plans and "information concerning existing and long range plans for bikeways." These requests for plans and information were made through the office of the Administrator, Highway Traffic Safety Division, Montana Department of Community Affairs, Helena, in order to enhance the possibility of positive responses.

Following the collection of the data, the results were analyzed.

FINDINGS

The findings resulting from this study will be reported in the following three sections: (1) Survey of Related Information; (2) Public Opinion Poll; and (3) Existing Bikeway Plans.

Survey of Related Information

The term "bikeway" as used in this study refers to the facilities that are designed for and used by persons traveling by bicycle. Bikeways, generally, fall into three types: (1) designated bike paths which are completely separated from other vehicular traffic, except for cross flows and some pedestrian traffic; (2) designated bike lanes along existing streets where the lanes are separated either by painted stripes or, in some cases, low barriers such as curbing; and (3) specially designated bike routes on streets which the bicyclist and the auto share--signing is generally used for this type to inform the users that it is classed as a bike route.

One of the critical factors in determining the ultimate use of any bikeway is the number of bicycles and bicycle riders in the given area. Since this study concerns a topic involving the possible substitution of bicycle use for automobile use, some comparative numbers of vehicles and vehicle users is important. The Federal Highway Administration automobile registration figures for 1976 estimated that there were 391,428 personal automobiles in the State of Montana, out of a total of 110,351,327 for the nation. Buses and trucks are in addition to these figures. The Transportation Energy Conservation Data Book, Edition 2,²¹ includes some regional estimates on the ratio of the number of vehicles predominantly used for personal use in relation to

Footnote numbers refer to the numbered list of Suggested References found in Appendix A.

the number of licensed drivers. Federal Region VIII, of which Montana is a part, had .95 personal use vehicles per licensed driver. The U.S. average was .89 vehicles per driver. If one assumes that the ratio of passenger vehicles to licensed drivers for Montana is similar to that for the total Federal Region VIII, then it would follow that there are approximately 370,000 licensed drivers in Montana. An examination of the data available on the number of bicycles in use and the estimated number of users reveals that in 1975 there were an estimated 79.2 million bicycles in use. See Figure 1, page 8. If one assumes that the number of bicycles in use is distributed nationally on the basis of population, the estimated number of bicycles in use in Montana in 1975 would approximate 270,000. Of the 118,900,000 estimated users in the United States (Figure 1), using the percentage of total population method, Montana has approximately 400,000 bicycle users. This would mean that from one-third to one-half of the total population of the State of Montana own and/or use bicycles. Thus it would appear that the potential for bicycle use as a means of personal transportation is very high in the State.

Another factor in the substitution of bicycle travel for automobile travel has to do with the length of the trip and, thereby, the feasibility of supplanting the automobile with the bicycle. In a nationwide personal transportation study (see Figure 2, page 9), Asin reported that more than 60% of all automobile trips were five miles or less in length and that trips over twenty-one miles in length accounted for nearly half of all of the vehicle miles traveled. Hoheisel,⁹ of the

THE NUMBER OF BICYCLES IN USE AND THE ESTIMATED NUMBER OF USERS FOR THE PAST FIFTEEN YEARS ARE INDICATED BELOW. THE TOTAL NUMBER OF BICYCLES MANUFACTURED NEARLY DOUBLED FROM 1960 TO 1968 AND PEAKED IN 1973 AT 15.3 MILLION. ALTHOUGH FEWER BICYCLES WERE MANUFACTURED IN 1975 (DUE MAINLY TO INVENTORY REDUCTIONS AMONG WHOLESALERS AND RETAILERS), THE NUMBER OF BICYCLES IN USE AND THE NUMBER OF USERS IS AT AN ALL-TIME HIGH.

Table 1-95. U.S. Manufactured and Imported Bicycles
(millions per year)

Year	Domestic shipments	Imports	Total U.S. and imported	Bikes in use ^a	Estimated users ^a
1960	2.6	1.1	3.8	23.5	35.2
1965	4.6	1.0	5.7	32.9	49.3
1968	6.0	1.5	7.5	42.3	63.4
1969	5.1	2.0	7.1	47.7	71.5
1970	5.0	1.9	6.9	50.0	75.3
1971	6.6	2.3	8.9	53.1	79.6
1972	8.8	5.1	13.9	61.2	91.9
1973	10.1	5.2	15.3	70.4	105.6
1974	10.1	4.0	14.1	78.2	117.3
1975	5.6	1.7	7.3	79.2	118.2

^aBikes-in-use estimate is based on an estimated bike "life" multiplied by a unit sales factor. Rentals and other multiple-use situations are calculated into the "Estimated users" estimates.

^bEstimated by Oak Ridge National Laboratory

Source: W. F. Gay, U.S. Department of Transportation, Transportation Systems Center, Summary of National Transportation Statistics, Cambridge, Mass., June 1976, p. 108. (Original source: Bicycle Manufacturers Association of America, Inc., Washington, D.C.)

FIGURE 1. Reproduced from Transportation Energy Conservation Data Book, Edition 2, p. 149.

MORE THAN THREE-FIFTHS OF ALL AUTOMOBILE TRIPS ARE 5 MILES OR LESS,
BUT TRIPS OF OVER 21 MILES ACCOUNT FOR ALMOST HALF OF ALL VMT'S.
AVERAGE TRIP LENGTH IS LONGEST IN RURAL AREAS AND IN THE LARGEST URBAN
AREAS.

Table 1-68.
Percent of Automobile Trips for all Trip Purposes by
Trip Length (Miles) and Place of Residence, 1969

Place of residence	Trip length - miles				Total	Trip length (miles)
	5 and less	6-10	11-20	21 and over		
Automobile trips						
Rural	55.1	21.6	15.1	8.2	100.0	
Urban						
Under 5,000	61.7	12.5	14.8	11.0	100.0	
5,000-24,999	67.5	14.2	11.0	7.3	100.0	
25,000-49,999	70.9	12.0	10.2	6.9	100.0	
50,000-99,999	70.3	15.1	7.8	6.8	100.0	
100,000-999,999	65.7	18.4	10.8	5.1	100.0	
1,000,000 and over	55.5	21.6	15.4	9.7	100.0	
Total Urban	66.2	15.4	11.1	7.3	100.0	
TOTAL	62.4	16.8	12.5	8.3	100.0	
Vehicle-miles of travel						
Rural	13.8	16.2	23.5	46.5	100.0	9.8
Urban						
Under 5,000	10.2	9.6	22.1	58.1	100.0	10.4
5,000-24,999	16.8	14.9	21.2	47.1	100.0	7.9
25,000-49,999	19.6	12.3	20.0	48.1	100.0	7.8
50,000-99,999	19.5	15.0	14.7	50.8	100.0	8.1
100,000-999,999	21.2	19.3	21.5	38.0	100.0	7.7
1,000,000 and over	10.6	15.3	17.9	56.2	100.0	11.7
Total Urban	16.8	15.0	20.2	48.0	100.0	8.4
TOTAL	15.7	15.4	21.9	47.4	100.0	8.9

¹Urban is defined here as all incorporated places; rural includes all unincorporated places.

Source: R.H. Asin, U.S.Department of Transportation, Federal Highway Administration, Nationwide Personal Transportation Study - Purposes of Automobile Trips and Travel, Report No. 10, Washington, D.C., May 1974, p. 16.

Policy Planning Division of the Federal Highway Administration, reports in "Energy Problem and Surface Transportation" that 1.8% of auto travel occurs in trips under one mile in length and 16% of auto travel results from trips under five miles in length. In 1974, Dougherty and Lawrence⁶ reported that the 1963 Home to Work Travel Survey of the Bureau of the Census documented that 20% of all urban work trips were under three miles and 54% were under five miles. They reported further that, according to the DOT Personal Transportation Survey of 1971, all trips under five miles represented 11.1% of all vehicle miles traveled.

The generally acceptable range for bicycle commuting has been assumed to be four miles per one-way trip. It has been estimated that if all urban trips shorter than four miles were converted to bicycle trips, approximately 8% of the vehicle miles traveled would be affected. Such a change would represent a 7.6% savings in energy consumed by transportation.

Hoheisel⁹ presented a fuel savings projection from the Highway Statistics Division, Federal Highway Administration, 1974, which indicates that the implementation of increased bicycle usage could generate a national savings of 50 million gallons of petroleum a year within the first year of implementation, with a potential maximum fuel savings of one billion gallons per year in ten years.

In Bicycle Transportation Dougherty and Lawrence⁶ reported that bicycling and walking are 10 - 40 times as efficient as motorized transports; that a bicyclist moving at 10 miles per hour uses only 97 BTU's per passenger mile, which is equivalent to 1,000 passenger miles per

gallon of petroleum fuel.

Although there are an estimated eight million bicycles in the nation, and perhaps 120 million riders, the fact remains that many people are deterred from using a bicycle as a significant and consistent mode of transportation--even for many short trips the typical individual makes. In their study of Bicycle Transportation, Dougherty and Lawrence⁶ identified four deterrents to a greater utilization of bicycles as a means of transportation. These four deterrents were: (a) high bicycle accident rate, (b) high bicycle theft rate, (c) exposure to automotive pollutants, and (d) lack of adequate financing for support facilities. They went on to suggest that cyclists' safety may best be improved through the construction of bikeways segregated from automobile traffic, the reduction of automotive travel, better education of cyclists, and an updating and enforcement of the traffic laws. They stated that bicycle theft can be combated by better law enforcement methods aimed at making resale of stolen bicycles a difficult and risky business, by developing more secure parking facilities, and by more effective locking devices for bicycles when they are not in use. They suggest that the exposure to excessive air pollution may be reduced through a means of segregated bikeways located sufficient distances from heavy automobile traffic, or on streets where automobiles are not permitted to travel. They state that the development of segregated bikeways and secure parking at public buildings and at mass transit stations will enhance the convenience of cycling and will assist in the removal of the other major obstacles to bicycle usage.

Another factor in the development of effective bikeways that must be considered is that of the purposes of the many short trips that people make utilizing automotive transportation which could be done by bicycle. Hough¹⁰ reported, as a result of a study of a suburban community of 40,000 persons, that an estimated 2,100,000 automobile trips were generated per year and that 29% of these trips were school related; 43% involved other activities; and only 27% were work related. An estimated 73% of all of the families in the study area engaged in "chauffeuring" activities which consume both fuel and adult time.

The routes selected for bikeways will, to a large extent, determine the amount and kind of use they will receive. The recreation cyclist most probably would prefer and support a route that is somewhat isolated and scenic; the commuter cyclist will be much more supportive of one that is direct and functional. Both groups, recreational and commuter, however, favor bike routes that are separated as much as possible from automobile traffic and, hence, a safer place to ride.

Securing community interest, enthusiasm, and financial support for worthwhile energy conservation projects such as bikeways can be difficult. The study reported by Hough,¹⁰ which was conducted in a suburban community of 40,000 persons and focused upon factors of community acceptance and support of bikeway construction, could be helpful in providing guidance for developing bikeways in Montana cities. This project is described in the following abstract (Energy Research Abstracts, Vol. 4, No. 6, page 1440):

A working incentive program for community acceptance on the costs and benefits of suburban bicycle paths is described. It was determined that voter perceptions hinged on four key constructs; many voters were concerned for the safety of cyclists and motorists; many parents found their chauffeuring activities to be time-consuming and unrewarding; motor vehicles were being used for short trips where bicycles could have been used on safe paths; and bicycle paths were seen to provide an important transportation option for youths seeking part-time employment. Voter perceptions on these constructs were carried out and a specific bike path network in a suburban community of 40,000 persons and 59 sq. mi. is analyzed. Results show that while the energy savings alone would be sufficient to offset the costs of construction for bike pathways in similar suburban communities (pop. density 1000/sq. mi.), the other constructs that govern public perceptions are even more important in their overall evaluation--a lesson for future energy-policy planning that seems unmistakable.

Public Opinion Poll

The assessment of Montana drivers' attitudes concerning bikeways was accomplished by means of a public opinion poll. The questions on bikeways were developed and, together with the questions for a companion study on right turn on red, were compiled into the questionnaire format. A copy of the questionnaire is included in Appendix B. Two data collectors were trained in the interviewing and administration of the questionnaire and then proceeded to travel to each of the thirteen largest urban centers of the State to gather the information. It was determined that an adequate sample of the study population would be an average of 250 questionnaires per city. This sample size was exceeded slightly, with an average of 268 completed, usable questionnaires per city.

The data were collected by interviewing people on a random basis at selected malls and shopping centers in each of the cities. No attempt was made to obtain any particular distribution of respondents on a basis of either sex or age. However, because of the nature of bicycle utilization, it was deemed important that the views of differing age groups may be meaningful; therefore, the questionnaire did include an item asking the respondents to identify their age range-- under 20, 21-40, 41-60, and over 60. A further analytic categorization was that of city size. For a list of the cities included in this study and the number of opinion poll respondents per city, please see Table 1, page 15.

It may be noted from an examination of Table 1 that the subject cities have been placed in population categories. The 1970 U.S. census figures were used in the categorization by population. An examination of the populations of the thirteen largest urban communities of the State revealed that they fell into some natural clusters according to size, with Billings and Great Falls being nearly the same size and markedly larger than any of the others; Butte, Helena, and Missoula, likewise, were roughly the same size with a slight gap to the next category where Bozeman, Havre, and Kalispell fell in the range of 10,000 to 20,000. It was noted that Anaconda and Miles City had very nearly the same populations in 1970 and, therefore, they were placed in the same category; likewise, Glendive, Lewistown, and Livingston had populations within a few hundred of each other and constitute the final category.

THIRTEEN LARGEST MONTANA CITIES
INCLUDED IN THE STUDY

POPULATION CATEGORY	CITY	NUMBER OF OPINION POLL RESPONDENTS
Over 60,000	Billings	282
	Great Falls	284
20,000-60,000	Butte	255
	Helena	242
	Missoula	292
10,000-20,000	Bozeman	300
	Havre	270
	Kalispell	239
8,000-10,000	Anaconda	301
	Miles City	255
6,000-8,000	Glendive	242
	Lewistown	279
	Livingston	239
Total Respondents		3,480

TABLE 1. Cities Included in the Study, by Population Categories, and Number of Opinion Poll Respondents in Each City.

Since, as a part of the study design, it was important to sample only the residents of each particular community, and also to poll only adults who were licensed drivers, the first two questions in the public opinion poll: "Do you live in the city limits?" and "Do you have a current Montana driver's license?" were used to ensure that the respondents fit the sampling requirements.

A summary of the distribution of the respondents, both by age group and city population category is displayed in Table 2, below. It may be noted that the age categories, 21-40 and 41-60 each have approximately one-third of the total number of respondents and that the remaining third is distributed between those under 20 and those over 60. The

POPULATION OF CITIES	NUMBER OF RESPONDENTS BY AGE GROUP					PERCENTAGE DISTRIBUTION
	Under 20	21-40	41-60	Over 60	Total	
Over 60,000	121	179	159	107	566	16.3
20,000-60,000	114	296	251	128	789	22.7
10,000-20,000	145	263	274	127	809	23.2
8,000-10,000	116	140	191	109	556	16.0
6,000-8,000	75	177	279	229	760	21.8
Totals	571	1055	1154	700	3480	
Percentage Distribution	16.4	30.3	33.2	20.1		

TABLE 2. Distribution of Public Opinion Poll Respondents by Age and Size of City.

largest disparity in this over-all age distribution of respondents is in the population category of 6,000-8,000 where three times as many over 60 persons were interviewed as were persons under 20. Each of the other four city-size categories reports almost equal numbers in these two extreme age categories. It should also be noted that three of the population categories each have slightly over 20% of the total number of respondents, whereas the over 60,000 and the 8,000-10,000 categories each have about 16% of the respondents. This occurred because the latter two categories are those which had only two cities included in that grouping, whereas the others each had three cities.

The distribution of responses to each question of the public opinion poll concerning this bikeway study by the 3,480 respondents are included in Appendix C. The distribution displays the number of respondents by population of cities and by age. A more complete discussion of the responses to each of the opinion poll questions follows.

The percentage distribution of the 3,480 responses to the question, "Do you drive to and from work?", by city population category, is presented in Table 3, page 18. It may be noted that 89.7% of the respondents indicated that they did drive to and from work; however, this percentage did not appear to be evenly distributed by city size. For example, those in the 20,000-60,000 category said, "no," three and one-half times as did those in the 8,000-10,000 category and slightly over twice as often as those in cities over 60,000 and those in the 10,000-20,000 group.

Do you drive to and from work?

POPULATION OF CITIES	RESPONSE PERCENT	
	<i>Yes</i>	<i>No</i>
Over 60,000	92.4	7.6
20,000-60,000	82.5	17.5
10,000-20,000	92.8	7.2
8,000-10,000	95.0	5.0
6,000-8,000	88.2	11.8
TOTAL	89.7	10.3

TABLE 3. Percentage Distribution of Responses to Public Opinion Poll Question 3.

Figure 3 on page 19 illustrates the distribution of these respondents on the basis of age. It may be noted that the 21-40 age group has a higher percentage who drive to work than any other age category, with the over 60's being significantly under the 21-40 group. Of the over 60 persons responding to the questionnaire, 19.6% indicated that they did not drive to and from work--a rate that is nearly twice that of either the under 20 or the 41-60 groups and nearly five times that of the 21-40 persons. It needs to be recognized that a significant number of the over 60 people polled may be retired and therefore do not drive to work. These distributions would appear to indicate that any move to alter persons' driving habits, in terms of commuting to and from work, might need to be varied in focus, depending upon the cities of residence and the ages of the target population.

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

Do you drive to and from work?

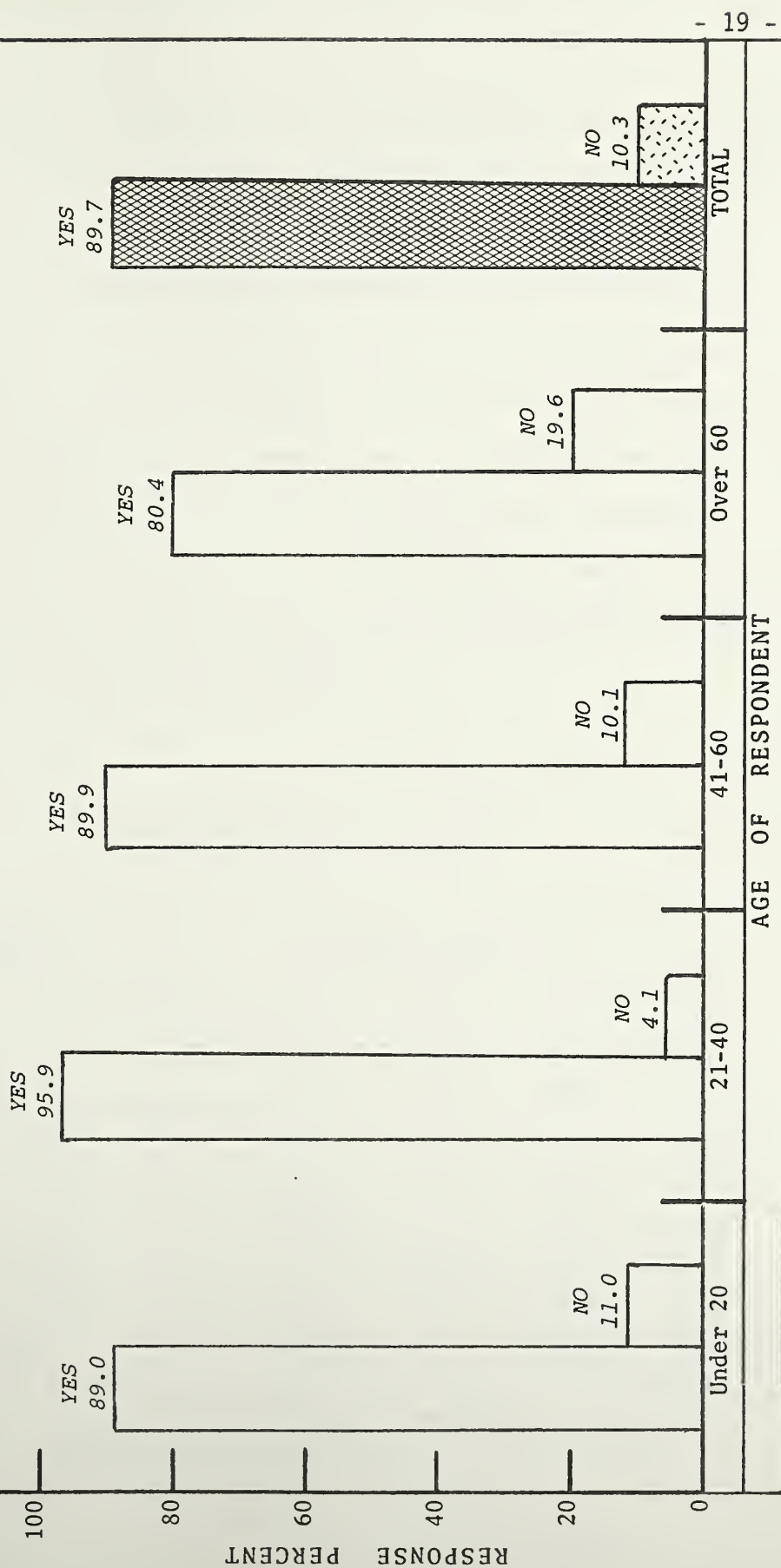


FIGURE 3. Percentage Distribution of Responses to Public Opinion Poll Question 3.

The information on Table 4, below, concerning the response to the question, "Do you participate in a carpool in going to and from work?" would appear to indicate that the residents of the cities of Butte, Helena, and Missoula participate in carpooling significantly more than do the residents of the other cities sampled. The respondents in the 20,000-60,000 group answered affirmatively three to six times as often as those in the other city-size categories. The information in Figure 4, page 21, reveals that there was not as much variation in response patterns by age as there was by city size although the under 20 responded with 2.6% affirmative, which was approximately one-third the response rate for each of the other age categories.

*Do you participate in a car pool
in going to and from work?*

POPULATION OF CITIES	RESPONSE PERCENT	
	<i>Yes</i>	<i>No</i>
Over 60,000	3.2	96.8
20,000-60,000	18.7	81.3
10,000-20,000	5.1	94.9
8,000-10,000	4.5	95.5
6,000-8,000	2.8	97.2
TOTAL	7.2	92.8

TABLE 4. Percentage Distribution of Responses to Public Opinion Poll Question 4.

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

Do you participate in a car pool going to and from work?

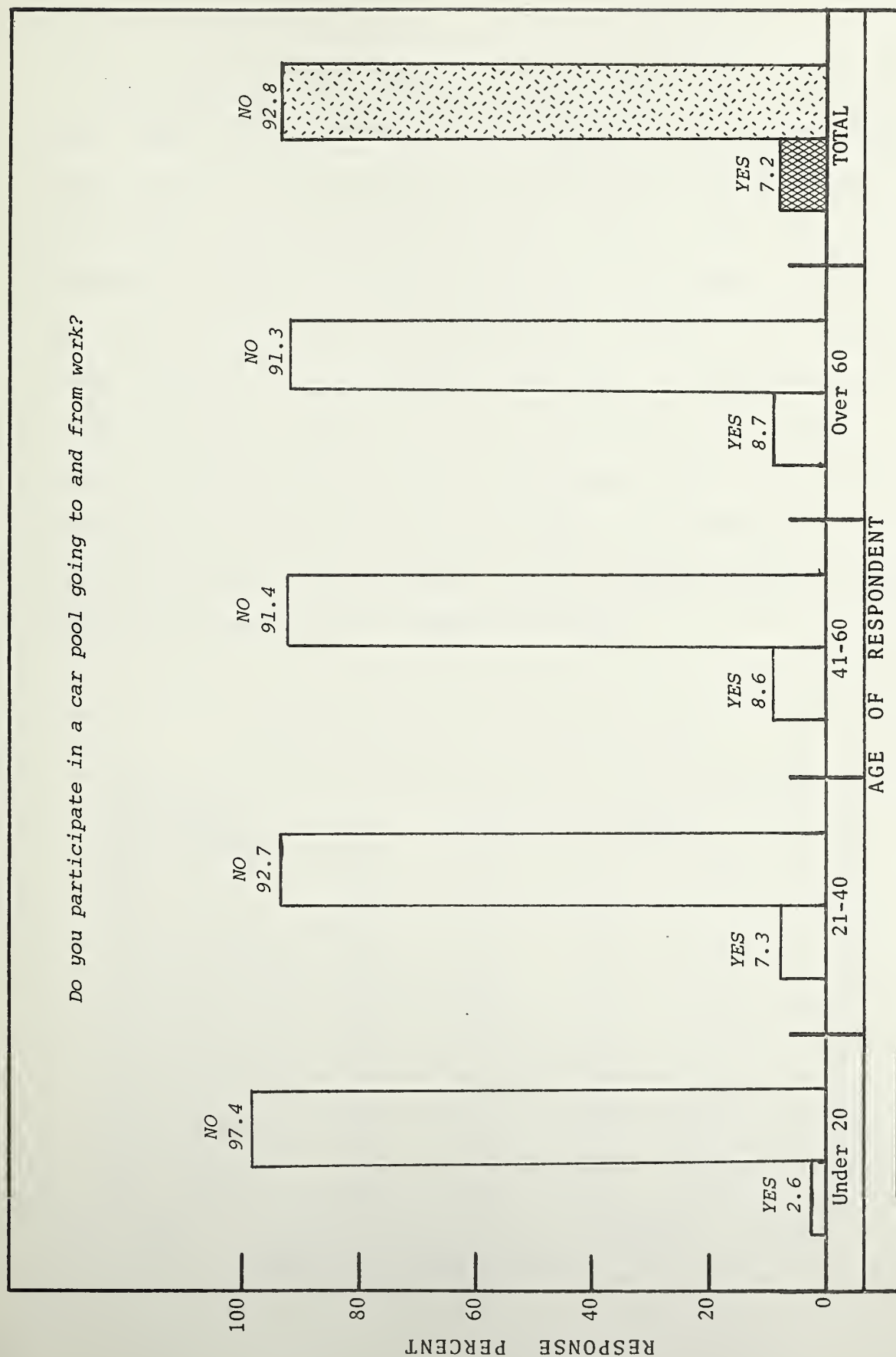


FIGURE 4. Percentage Distribution of Responses to Public Opinion Poll Question 4.

The responses to the question: "Do you usually ride a bicycle to work?" shows that only 5% of the people sampled in the thirteen largest cities of Montana ride a bicycle to work, with 95% using other means of transportation. The under 20 age category (Figure 5, page 23) and the 21-40 group reported the highest percentages of bike usage, with the rate for the 41-60 people being approximately one-third that of the two younger groups, and the over 60 being even less. An examination of the use of bicycles for commuting to work by city size, Table 5, below, reveals a tenfold difference between the highest rate of usage, 8% for the 20,000-60,000 group and only eight-tenths of one percent for the 6,000-8,000 group. The two largest city-size categories had the highest rates of bike utilization for commuting to work.

Do you usually ride a bicycle to work?

POPULATION OF CITIES	RESPONSE PERCENT	
	<i>Yes</i>	<i>No</i>
Over 60,000	7.4	92.6
20,000-60,000	8.0	92.0
10,000-20,000	5.9	94.1
8,000-10,000	2.9	97.1
6,000-8,000	0.8	99.2
TOTAL	5.0	95.0

TABLE 5. Percentage Distribution of Responses to Public Opinion Poll Question 6a.

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

Do you usually ride a bicycle to work?

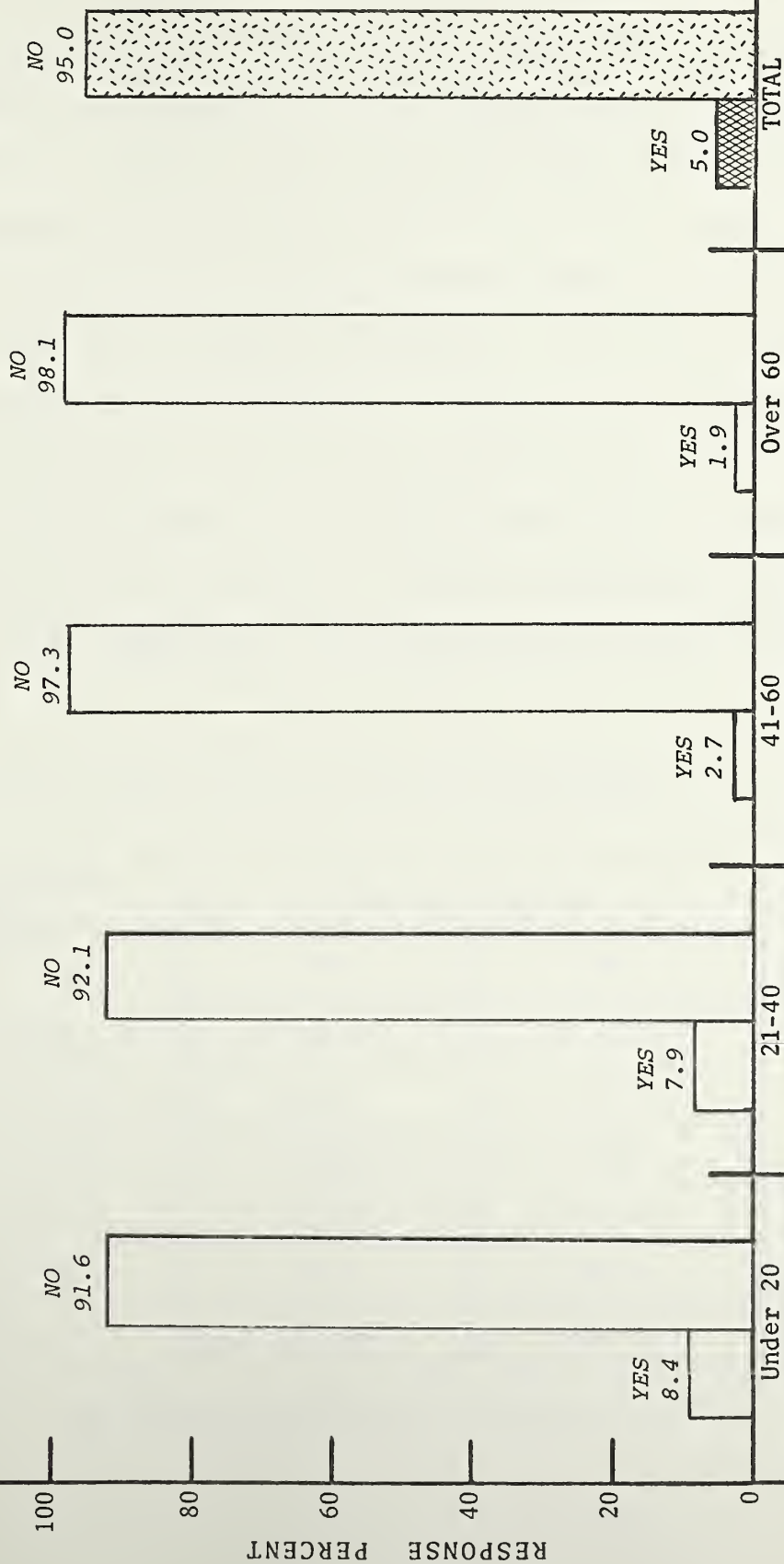


FIGURE 5. Percentage Distribution of Responses to Public Opinion Poll Question 6a.

The associate question: "Do you usually ride a bicycle for recreation?" revealed a significantly different response pattern, Table 6, below, and Figure 6, page 26. Two-thirds of the nearly 3,500 persons questioned responded, "yes." The distribution of positive responses was higher in the top three city-size categories than it was in the cities in the two smaller population categories. In Billings and Great Falls 74.6% answered, "yes;" 67.9% "yes" in Butte, Helena, and Missoula; and 80.5% in Bozeman, Havre, and Kalispell; with just under 56% in each of the other city-size groups. It is possible that the 67.9% level for the Butte, Helena, Missoula categories instead of the higher percentages of the other larger communities could be the result of terrain differences.

Do you usually ride a bicycle for recreation?

POPULATION OF CITIES	RESPONSE PERCENT	
	<i>Yes</i>	<i>No</i>
Over 60,000	74.6	25.4
20,000-60,000	67.9	32.1
10,000-20,000	80.5	19.5
8,000-10,000	55.8	44.2
6,000-8,000	55.7	44.3
TOTAL	67.3	32.7

TABLE 6. Percentage Distribution of Responses to Public Opinion Poll Question 6b.

An examination of the distribution of responses according to age groups, Figure 6, page 26, reveals that the under 20 group, with 87.7% usage, was only slightly higher than the 81.5% for the 21-40 age group. It then dropped to 69.2% in the 41-60 bracket, to a low of 26% who usually ride for recreation in the over 60 age category. This apparently high rate of usage of bicycles appears to correlate quite well with the projections made in the preceding section relative to the estimates of bike ownership and ridership in Montana based upon gross national figures. The marked difference in responses between this question and the preceding one relative to using a bicycle as transportation to and from work is worthy of noting.

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

Do you usually ride a bicycle for recreation?

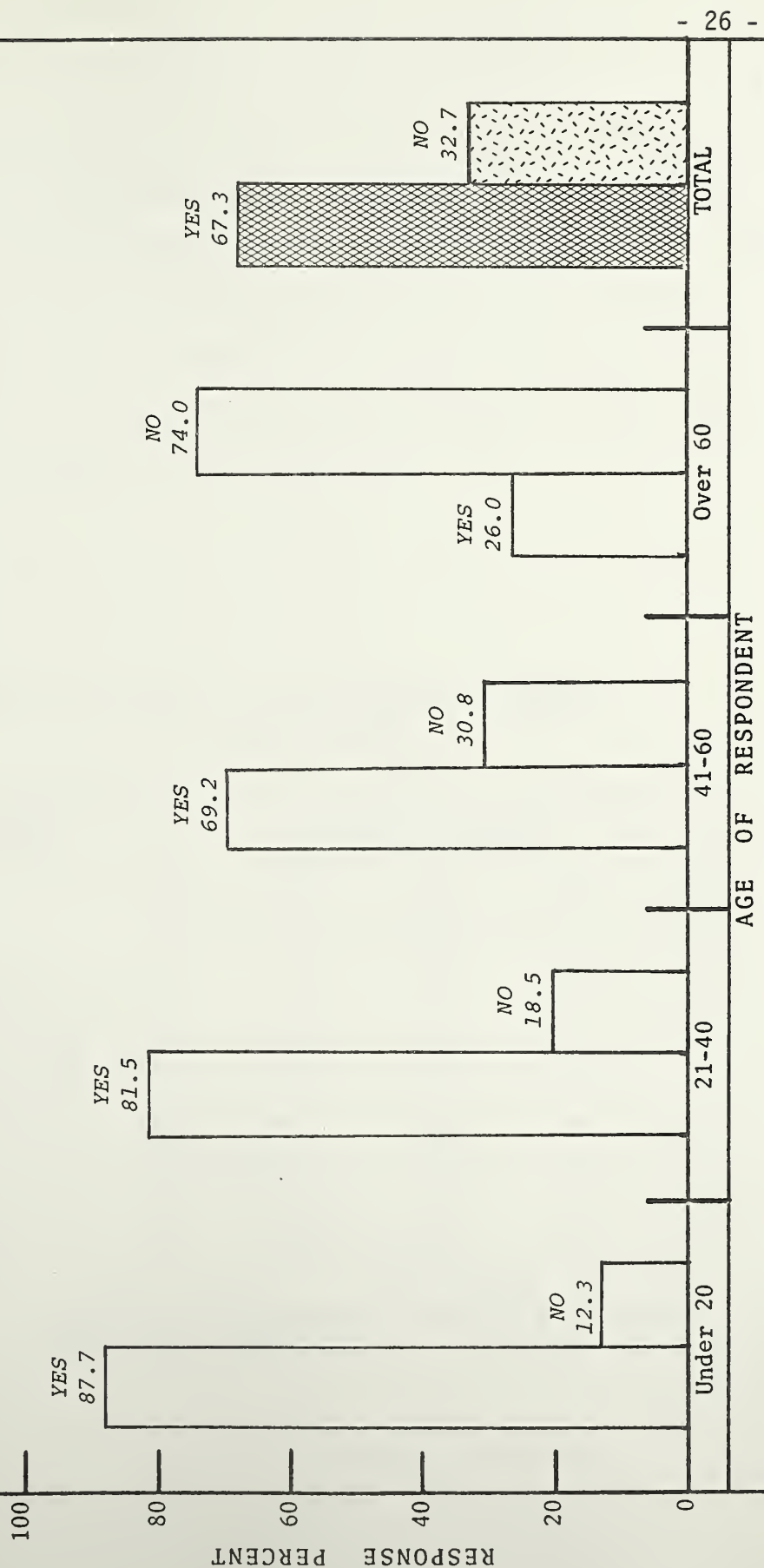


FIGURE 6. Percentage Distribution of Responses to Public Opinion Poll Question 6b.

The question, "Would you support the development of bikeways in your community?" received an over-all affirmative response of 97.8%, with only two percentage points of differences in range among the city-size categories (Table 7, below) and only a 4.2% range according to age distribution (Figure 7, page 28). According to this poll, all age groups in all the study sample cities are highly in favor of the development of bikeways in their communities.

*Would you support the development of bikeways
in your community?*

POPULATION OF CITIES	RESPONSE PERCENT	
	<i>Yes</i>	<i>No</i>
Over 60,000	98.4	1.6
20,000-60,000	99.1	0.9
10,000-20,000	97.2	2.8
8,000-10,000	97.1	2.9
6,000-8,000	97.1	2.9
TOTAL	97.8	2.2

TABLE 7. Percentage Distribution of Responses to Public Opinion Poll Question 7.

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

Would you support the development of bikeways in your community?

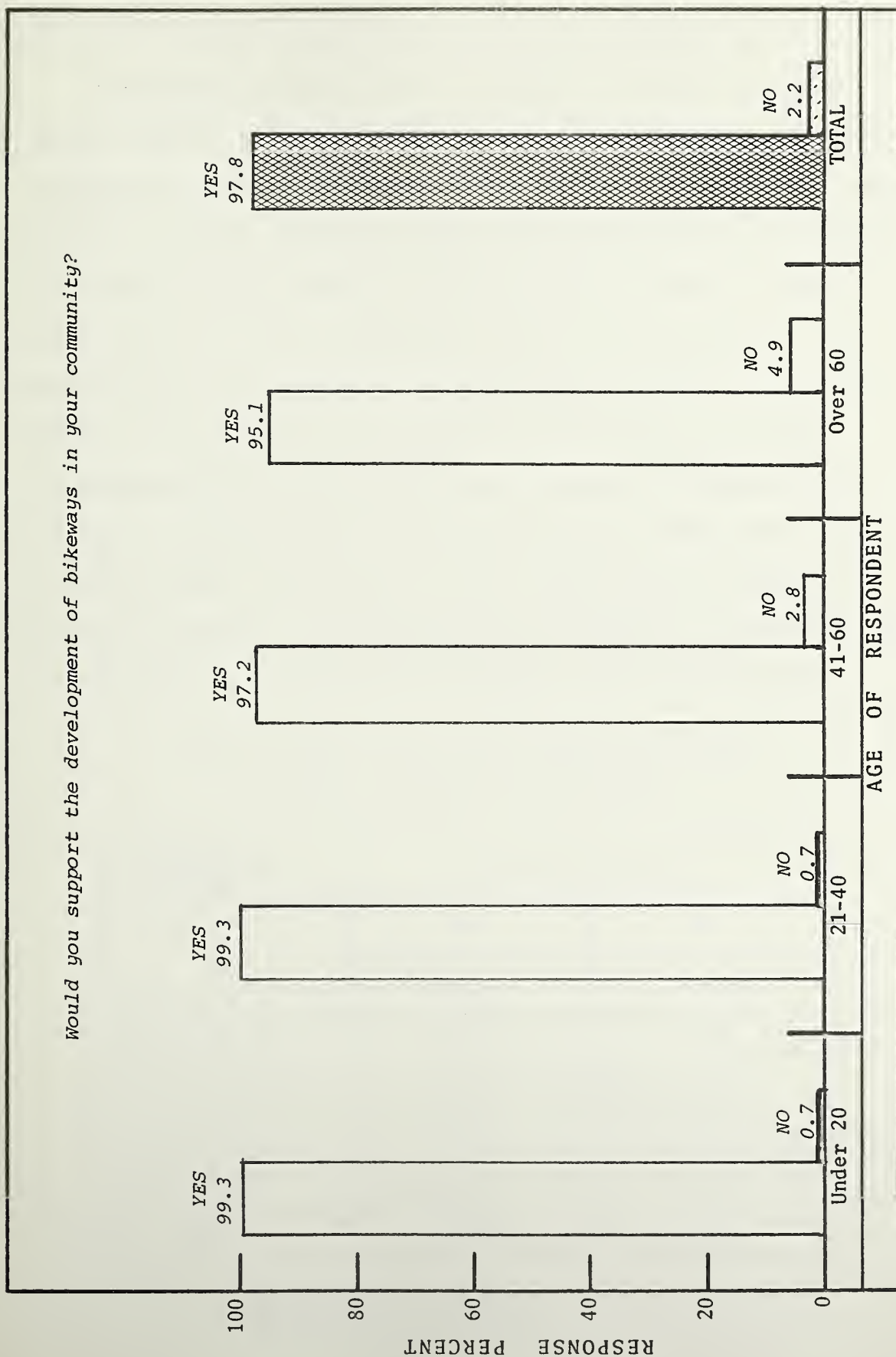


FIGURE 7. Percentage Distribution of Responses to Public Opinion Poll Question 7.

The question designed to test responses to the development of special lanes on existing streets for bicycle use, which incidentally is generally the most inexpensive method of establishing bikeways, was: "Would you support the use of streets with areas specially designated for bicycles?" The responses to this question in Table 8, below, reveal that 97.1% of all respondents said, "yes," and that, of the people sampled, over 95% were in favor in every category of city size sampled. Only one-half of one percent in the cities over 60,000 responded negatively to this question. The age distribution diagram in Figure 8, page 30, shows that there is a very strong support base in all age groups for the use of streets with specially designated areas for bicycles. The largest negative response to the use of streets in this manner was in the over 60 category, with 7% saying, "no."

*Would you support the use of streets with areas
specially designated for bicycles?*

POPULATION OF CITIES	RESPONSE PERCENT	
	<i>Yes</i>	<i>No</i>
Over 60,000	99.5	0.5
20,000-60,000	98.4	1.6
10,000-20,000	96.4	3.6
8,000-10,000	96.0	4.0
6,000-8,000	95.7	4.3
TOTAL	97.1	2.9

TABLE 8. Percentage Distribution of Responses to Public Opinion Poll Question 8.

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

Would you support the use of streets with areas specially designated for bicycles?

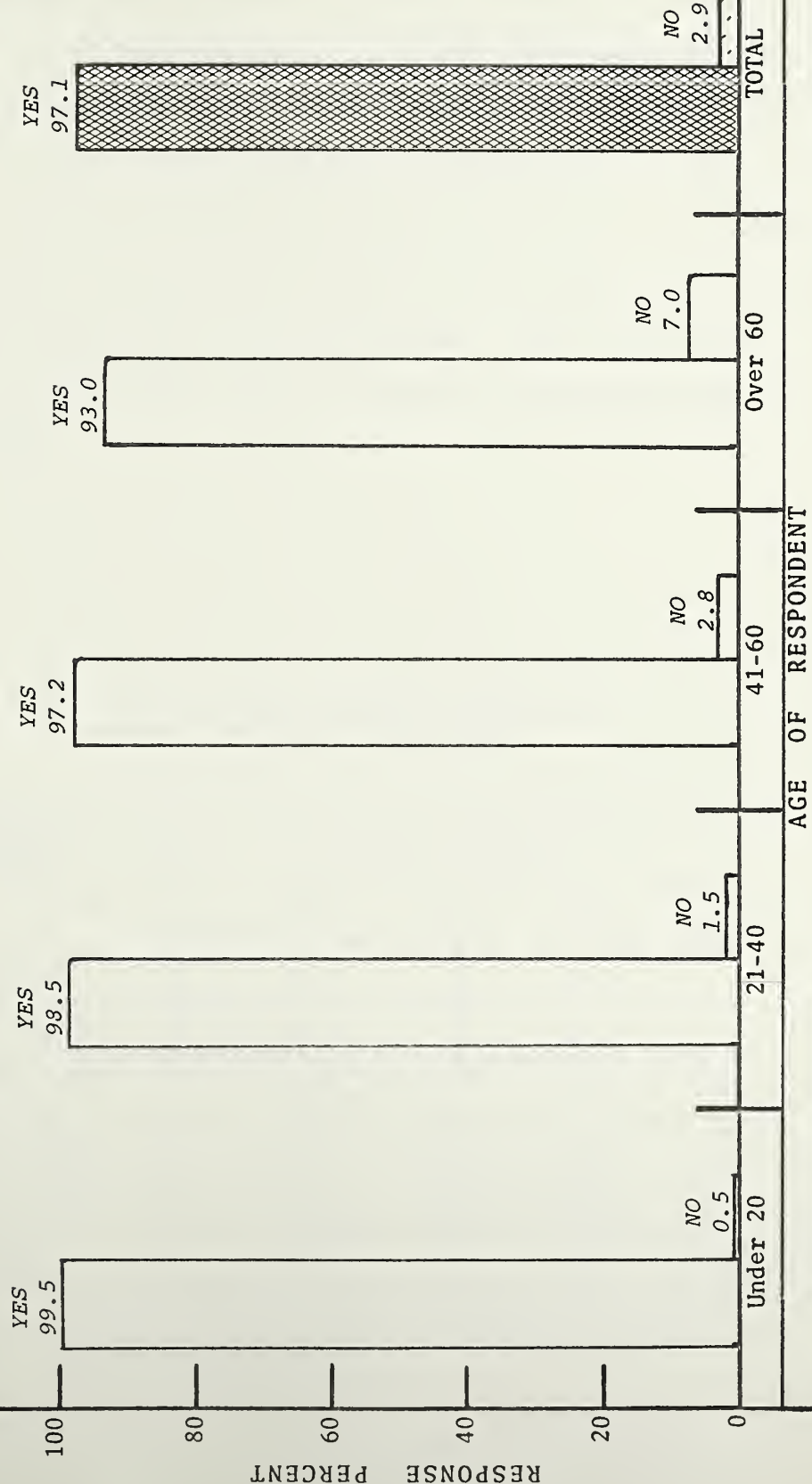


FIGURE 8. Percentage Distribution of Responses to Public Opinion Poll Question 8.

The question linking bikeways to using a bicycle as a means of commuting to and from work which read, "If there were more bikeways, would you ride a bicycle to work more?" resulted in 60% saying, "yes" and 40% saying, "no." The distribution of responses according to city size, Table 9, below, reveals that those in the cities in the 8,000-10,000 population size responded, "yes" 77% of the time, whereas those in the smallest population category responded, "yes," only 39.2% of the time. The other three city-size categories experienced approximately 60% yeses.

*If there were more bikeways, would you
ride a bicycle to work more?*

POPULATION OF CITIES	RESPONSE PERCENT	
	<i>Yes</i>	<i>No</i>
Over 60,000	61.7	38.3
20,000-60,000	67.7	32.3
10,000-20,000	59.8	40.2
8,000-10,000	77.3	22.7
6,000-8,000	39.2	60.8
TOTAL	60.4	39.6

TABLE 9. Percentage Distribution of Responses to Public Opinion Poll Question 9.

The age distribution of responses to the question, "If there were more bikeways, would you ride a bicycle to work more?" Figure 9, page 33, shows that the under 20 group responded, "yes," about three times as frequently as did the over 60 and that there appears to be a general dropping of affirmative responses by age category. It should be noted that 60% of the people polled indicated they would ride a bicycle to work more if there were more bikeways, whereas they state that presently only 5% use a bicycle as a means of commuting (Table 5, page 22).

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

If there were more bikeways, would you ride a bicycle to work more?

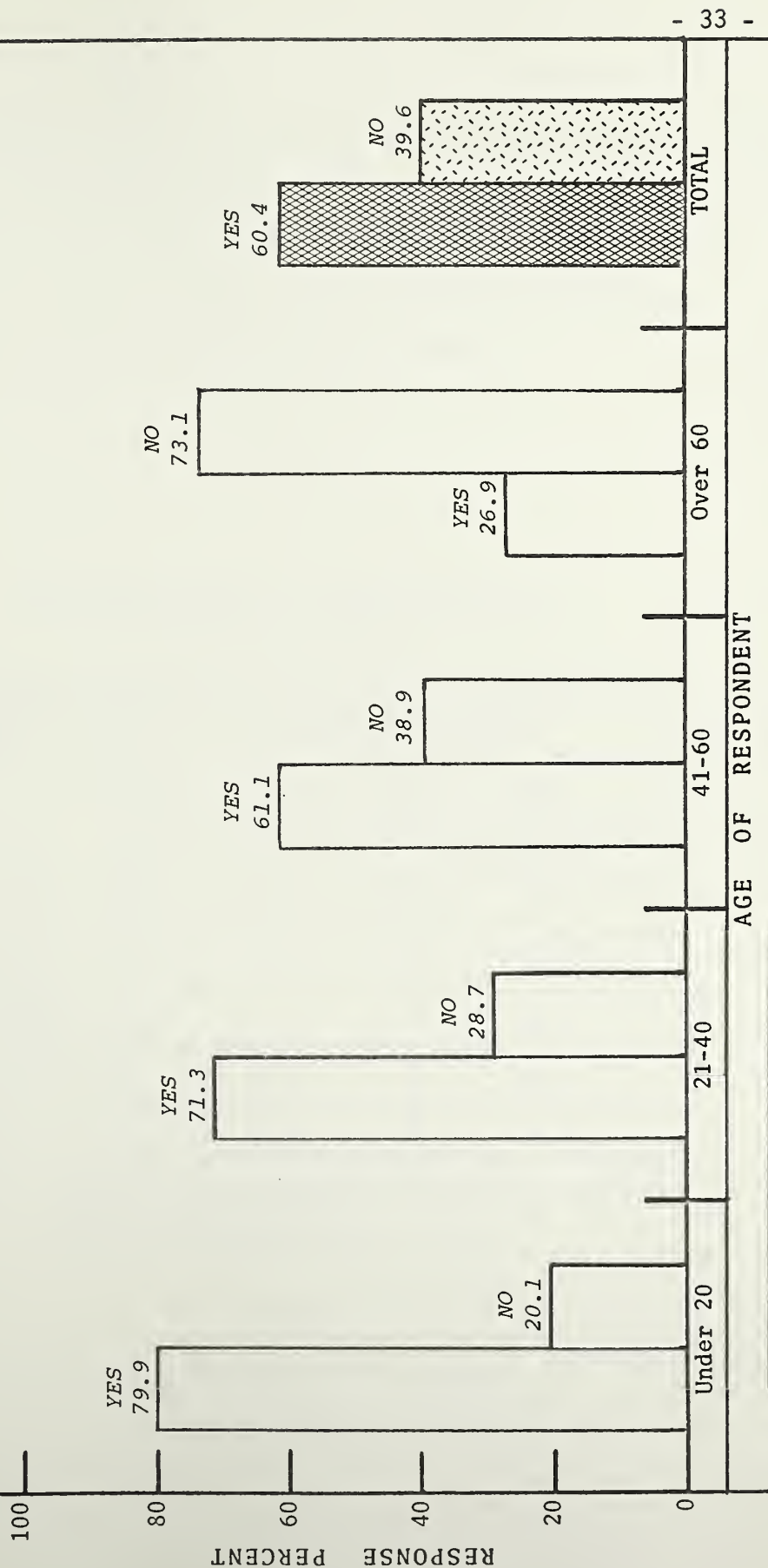


FIGURE 9. Percentage Distribution of Responses to Public Opinion Poll Question 9.

In attempting to project future expectations concerning bike use, the question, "Do you see yourself riding a bike more in the next five years?" elicited a 71.9% "yes" response which was distributed fairly evenly across all sizes of cities except for smaller communities which reported a 57.9% "yes" rate, Table 10, below.

*Do you see yourself riding a bike more
in the next 5 years?*

POPULATION OF CITIES	RESPONSE PERCENT	
	<i>Yes</i>	<i>No</i>
Over 60,000	73.3	26.7
20,000-60,000	77.4	22.6
10,000-20,000	77.3	22.7
8,000-10,000	73.9	26.1
6,000-8,000	57.9	42.1
TOTAL	71.9	28.1

TABLE 10. Percentage Distribution of Responses to Public Opinion Poll Question 10.

From the answers given it would appear that nearly 90% of those under 40 anticipate riding a bike more in the next five years, Figure 10, page 36. Slightly over three-fourths of those in the 41-60 age group and approximately one-fourth of those in the over 60 category indicated the expectation of riding more. With the exception of the over 60 category, these percentages were from 10 to 18% higher for each of the age categories than the responses to the question concerning riding a bicycle to work more if there were more bikeways. It would appear from the responses to this question that nearly three-fourths of the people polled are anticipating utilizing a bicycle for transportation more than they have in the past.

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

Do you see yourself riding a bike more in the next 5 years?

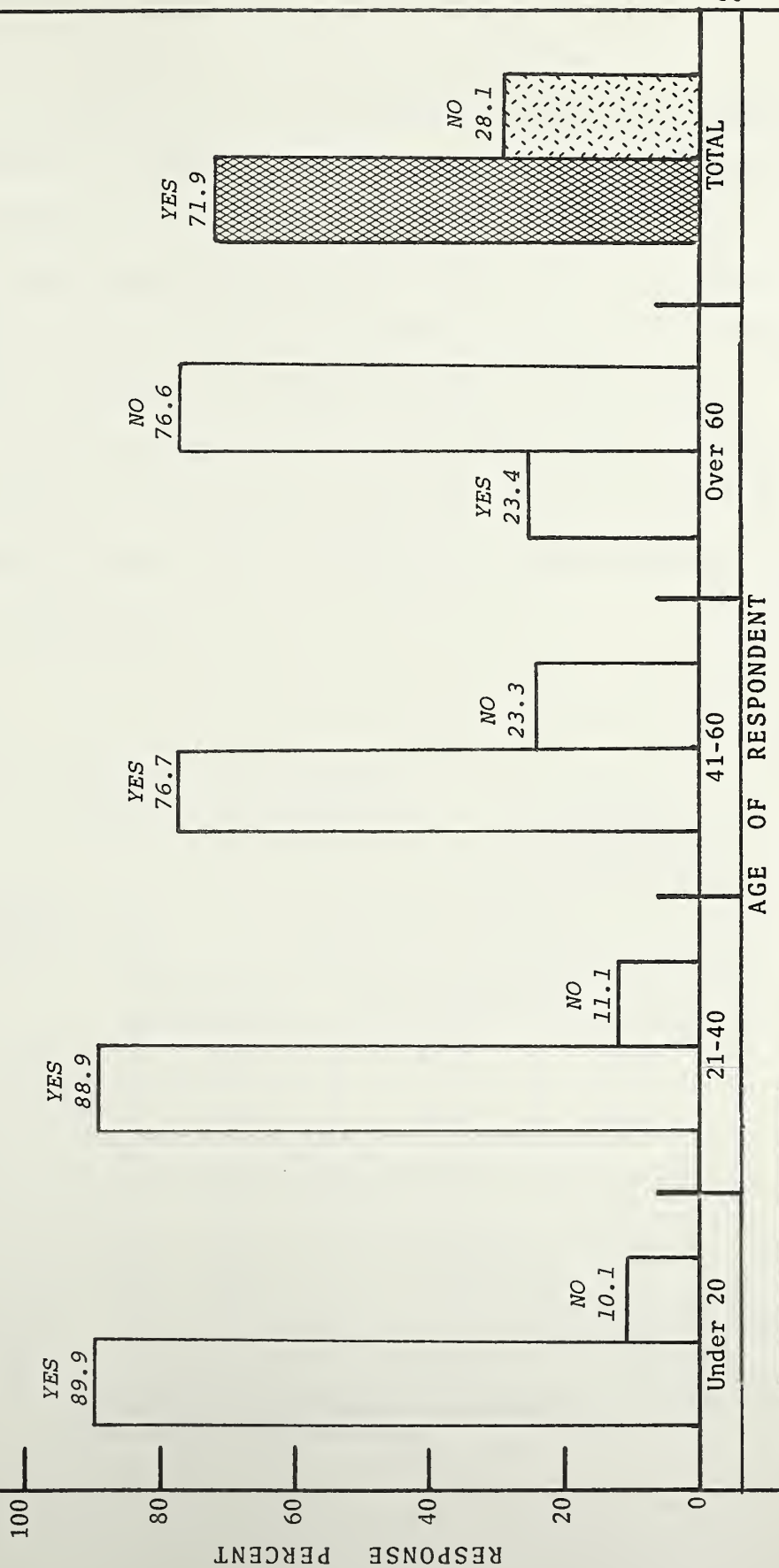


FIGURE 10. Percentage Distribution of Responses to Public Opinion Poll Question 10.

To obtain the opinions of the persons polled concerning Montana's support of bikeways, the question, "Do you think the state's current investment in bikeways is: too much, about right, too little?" was used. Results showed about 80% responding in the "too little" category; about 20% stating, "about right;" and two-tenths of one percent stating, "too much." There appeared to be some differences in the response percentages by city-size categories (Table 11, below) with the people from the 6,000-8,000 size communities responding, "too little," 92.3% of the time; whereas those in the 20,000-60,000 category answered, "too little," 65.1% of the time.

Do you think the state's current investment in bikeways is:

- 1 - too much
- 2 - about right
- 3 - too little

POPULATION OF CITIES	RESPONSE PERCENT		
	<i>Too Much</i>	<i>About Right</i>	<i>Too Little</i>
Over 60,000	0.0	17.8	82.2
20,000-60,000	0.5	34.4	65.1
10,000-20,000	0.1	23.4	76.5
8,000-10,000	0.2	15.8	84.0
6,000-8,000	0.1	7.6	92.3
TOTAL	0.2	20.3	79.5

TABLE 11. Percentage Distribution of Responses to Public Opinion Poll Question 11.

The distribution of responses to the question concerning Montana's support of bikeways, by age category, Figure 11, page 39, reveals that in the three youngest age categories there was very little difference in response pattern, with slightly over 80% in each category answering, "too little," and from 16% to 19% stating, "about right." The over 60 category was higher in the "about right" choice, with 30%; and 70% selecting the "too little" choice. If this sample is representative of the population of the State, it would appear that there could be significant support for investing in more bikeways.

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

1 - too much
2 - about right
3 - too little

Do you think the state's current investment in bikeways is:

RESPONSE PERCENT

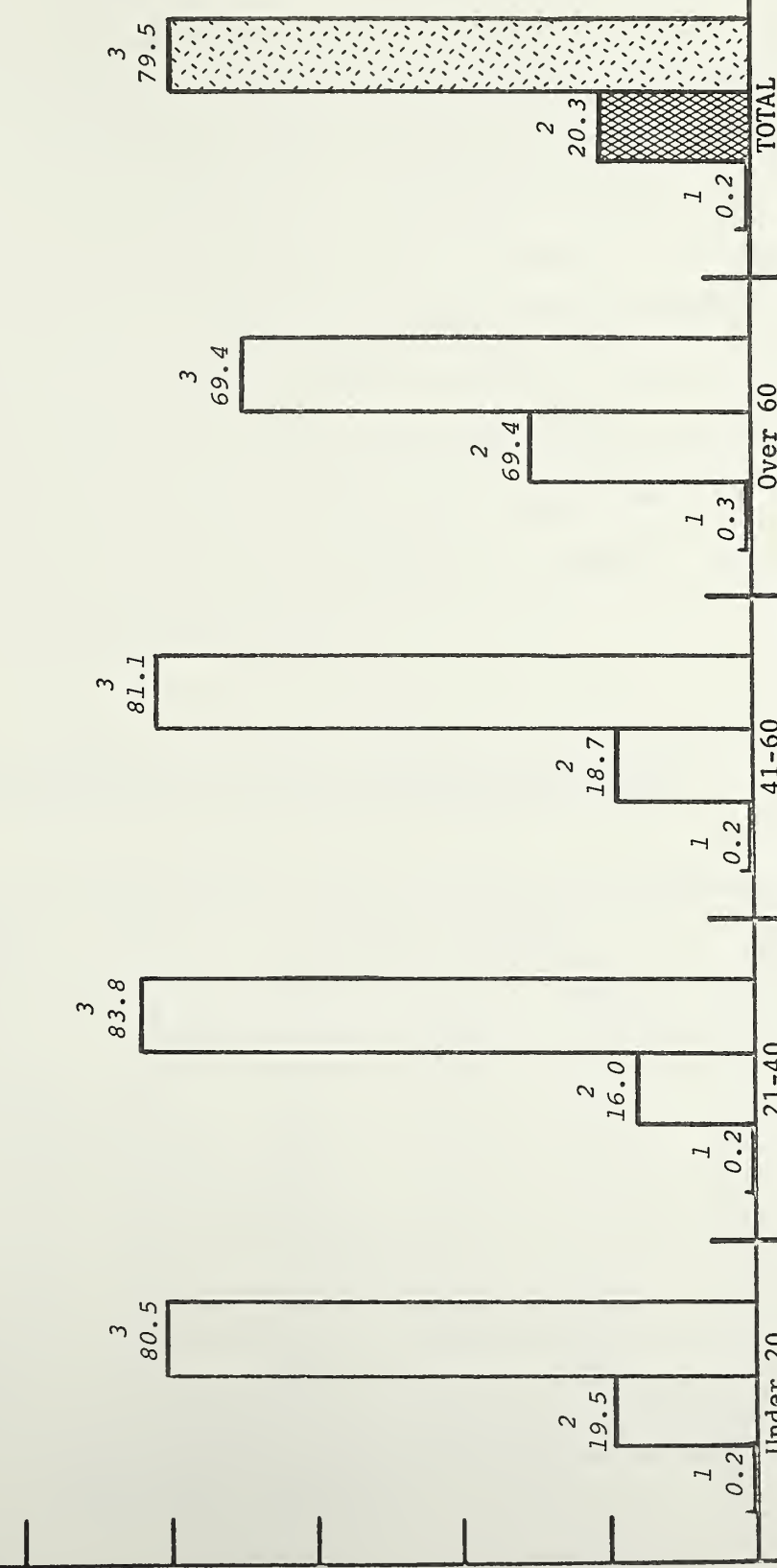


FIGURE 11. Percentage Distribution of Responses to Public Opinion Poll Question 11.

In conjunction with the opinions to the previous question concerning the state's investment in bikeways, the next question, "Would you support using state road construction and maintenance funds to build and maintain bikeways?" was designed to assess Montanan's attitudes toward a specific means of financing the construction and operation of bikeways. In this yes-no question, 88.8% indicated in the affirmative. The "yes" responses were fairly evenly distributed across the communities sampled (Table 12, below) with the largest and the smallest giving a negative response 14% and 15%, respectively, as compared to the 8% to 10% response for the other cities.

Would you support using state road construction and maintenance funds to build and maintain bikeways?

POPULATION OF CITIES	RESPONSE PERCENT	
	<i>Yes</i>	<i>No</i>
Over 60,000	86.0	14.0
20,000-60,000	89.9	10.1
10,000-20,000	91.3	8.7
8,000-10,000	91.7	8.3
6,000-8,000	85.1	14.9
TOTAL	88.8	11.2

TABLE 12. Percentage Distribution of Responses to Public Opinion Poll Question 12.

The younger people appeared to be more inclined to utilize State road construction and maintenance funds to build and maintain bikeways than did those in the older categories, Figure 12, page 42. Over 97% of those under 20 indicated support for such a use of funds, with a gradual drop in the other age categories to the point where four out of five in the over 60 group said, "yes."

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

Would you support using state road construction and maintenance funds to build and maintain bikeways?

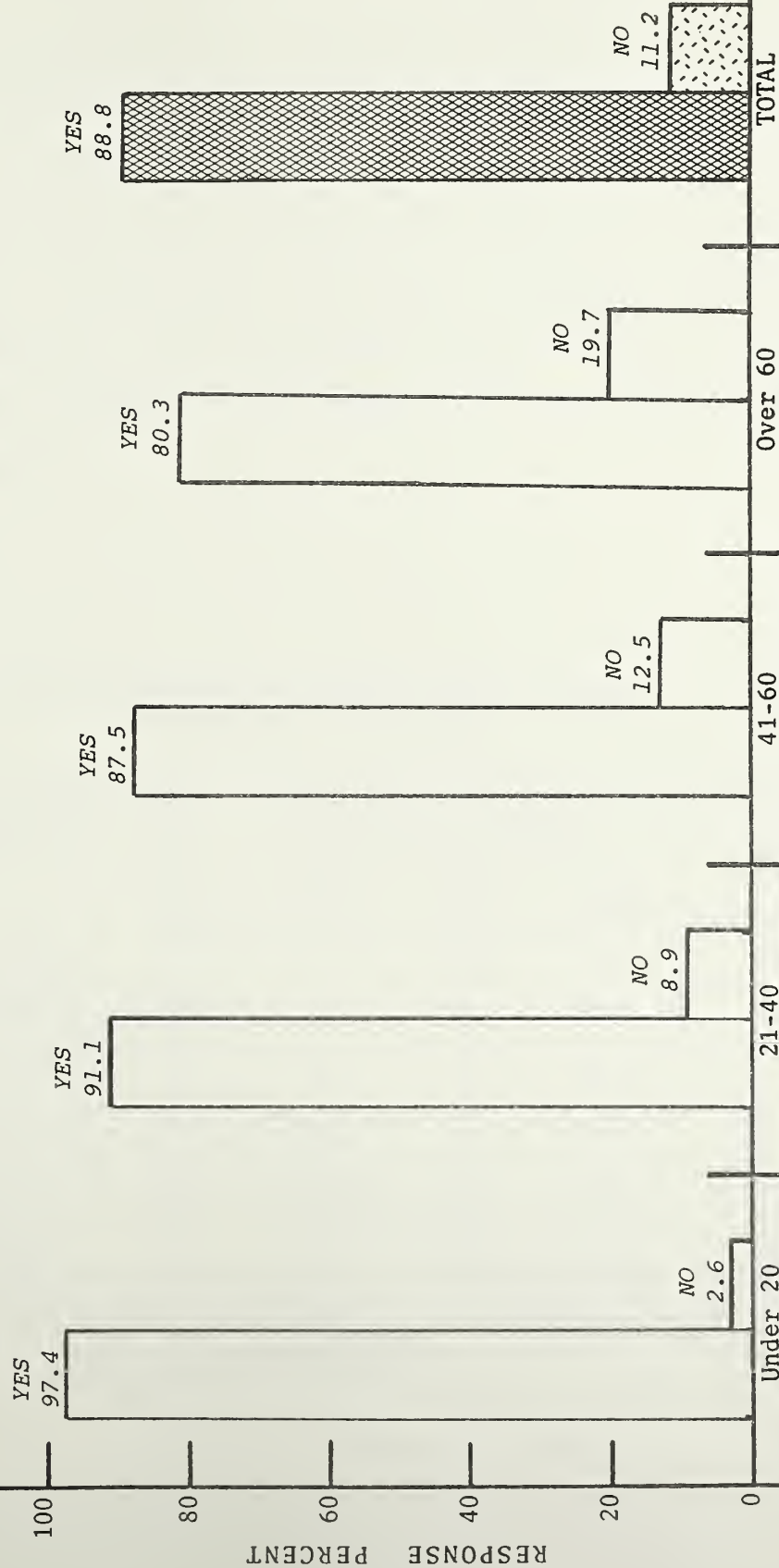


FIGURE 12. Percentage Distribution of Responses to Public Opinion Poll Question 12.

Personal safety is of vital importance to bicyclists and can greatly influence the use of the vehicle; therefore, the question, "Are bike safety information and training adequate in this city?" was included in the opinion poll. Of the nearly 3,500 persons polled, 99% answered, "no," to the question. This view of inadequate training and safety information was evenly distributed across all sizes of cities, Table 13, below. Likewise, all age groups indicated a similar response, Figure 13, page 44.

*Are bike safety information and training
adequate in this city?*

POPULATION OF CITIES	RESPONSE PERCENT	
	<i>Yes</i>	<i>No</i>
Over 60,000	1.1	98.9
20,000-60,000	1.3	98.7
10,000-20,000	1.1	98.9
8,000-10,000	1.6	98.4
6,000-8,000	0.3	99.7
TOTAL	1.0	99.0

TABLE 13. Percentage Distribution of Responses to Public Opinion Poll Question 13.

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

Are bike safety information and training adequate in this city?

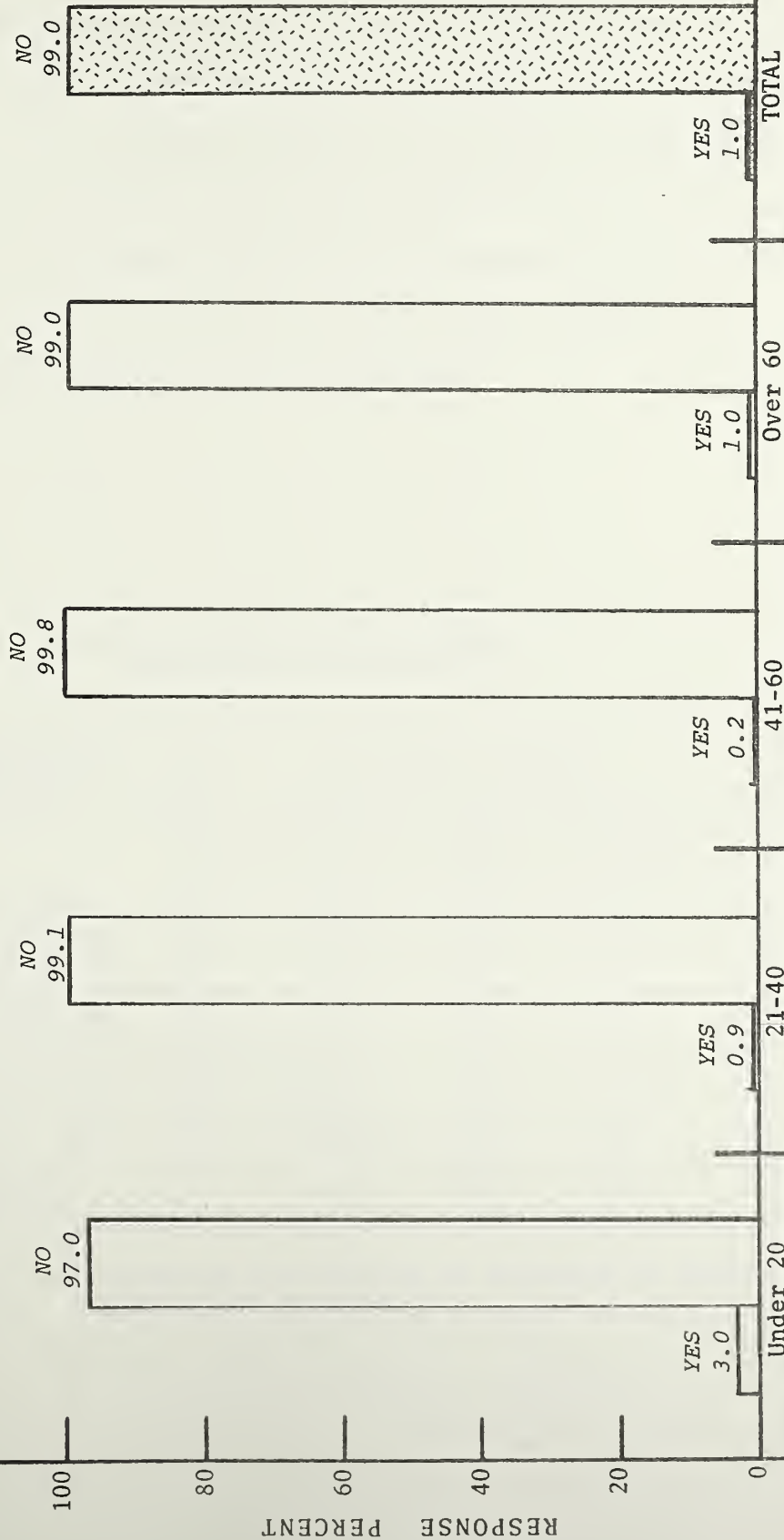


FIGURE 13. Percentage Distribution of Responses to Public Opinion Poll Question 13.

A second question, also associated with bicycle safety, was asked. The question read: "Would you support law enforcement of regulations on bike use?" This question resulted in 97.1% of all respondents saying they would support such law enforcement, Table 14, below. The respondents in the 8,000-10,000 population communities said, "no," about 7.6% of the time, whereas the other communities had a "no" response rate of between one and two percent.

*Would you support law enforcement of
regulations on bike use?*

POPULATION OF CITIES	RESPONSE PERCENT	
	<i>Yes</i>	<i>No</i>
Over 60,000	98.9	1.1
20,000-60,000	98.9	1.1
10,000-20,000	97.5	2.5
8,000-10,000	92.4	7.6
6,000-8,000	97.0	3.0
TOTAL	97.1	2.9

TABLE 14. Percentage Distribution of Responses to Public Opinion Poll Question 14.

The distribution of responses by age category to the question concerning law enforcement of regulations on bike use (Figure 14, page 47) shows that the over 60 persons and the under 20 persons were slightly less supportive than were those in the two middle categories of age groups, with the over 60 saying, "no," 6.4% of the time and the under 20 group saying, "no" 4.7% of the time.

Thus it would appear from this opinion poll that Montanans would generally support more bikeways, would use them if they were provided, and are interested in improved bicycle safety.

PUBLIC OPINION POLL RESPONSES BY AGE GROUP

Would you support law enforcement of regulations on bike use?

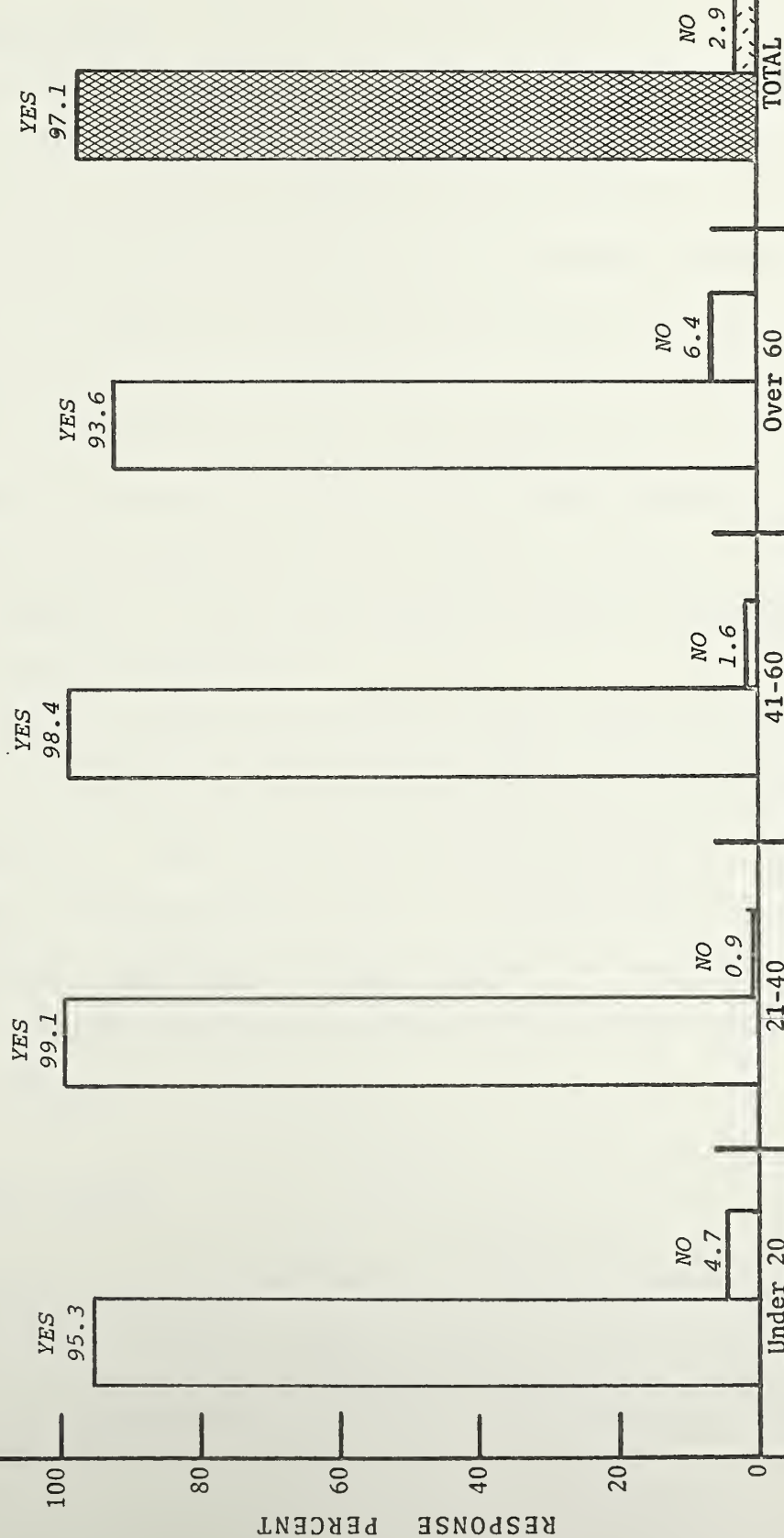


FIGURE 14. Percentage Distribution of Responses to Public Opinion Poll Question 14.

Existing Bikeway Plans

The expansion of bikeways within the State of Montana will require a significant amount of planning before any measurable modification in energy consumption can occur. Therefore, it was desirable to document any current bikeway plans existing in any of the thirteen cities of the study area in order that the State may use them for future reference. To perform this task of documentation, it was decided that the Administrator of the Montana Highway Traffic Safety Division would contact responsible officials in each of the thirteen communities and solicit copies of any information and/or plans for bikeways for each particular community. A copy of the letter of request for bikeway information appears in Appendix D.

Of the thirteen communities contacted, eleven either did not respond or wrote stating that they had no published plans for bikeways in their communities. Only two of the cities stated they had current bikeway plans: Billings and Great Falls. A reproduced copy of the Billings, Montana, Comprehensive Bikeway Plan may be found in Appendix E. Appendix F contains a reproduced copy of the Bikeway Plan, Great Falls, Montana.

BIKEWAY ENERGY SAVINGS

As stated on pages 53 and 54 of the 1977 Montana Energy Conservation Plan which was revised in January, 1978, the energy savings for 1980 due to the implementation of bikeways in the cities of Billings,

Great Falls, Miles City, and Missoula was estimated at $.0032 \times 10^{12}$ BTU's. This energy savings estimate was developed from extensive energy savings calculations done at the local level and still appears to be valid for the implementation of bikeway plans in the four cities listed.

A comparison of the 1970 combined populations of these four cities with the combined populations of the thirteen cities included in this study shows that the four cities had a combined population of approximately 160,000 and the thirteen cities, 275,000. If one assumes that the potential bicycle use for the thirteen cities would be similar to the four cited in the State energy plan, the projection of potential energy use for the thirteen largest cities due to implementation of bikeways would be $.0055 \times 10^{12}$ BTU's.

Fuel savings projections from the Federal Highway Administration, Highway Statistics Division, as reported by Hoheisel (see page 10) indicated that the implementation of increased bicycle usage could save 50 million gallons of petroleum in the first year. If one assumes that such a potential savings would be distributed across the nation on the basis of population, Montana, with 0.34 percent of the U.S. population may realize a savings of 170,000 gallons of petroleum per year through the implementation of increased bike ridership. The proportionate savings for the thirteen cities included in this study would be 66,800 gallons of petroleum. However, since the weather greatly affects bicycle use and because during about four winter months in Montana it is frequently unsafe, or at least unpleasant, to ride bikes extensively, a more realistic estimate of potential fuel savings in the thirteen

cities due to increased bike utilization is 44,500 gallons of petroleum or $.00556 \times 10^{12}$ BTU's. This is virtually the same estimate of fuel savings computed on the basis of the projections for the four cities mentioned earlier.

Thus it is estimated that approximately $.0055 \times 10^{12}$ BTU's or 44,500 gallons of petroleum could be saved by the implementation of adequate bikeway systems in all of the thirteen largest cities of Montana.

CONCLUSIONS

Conclusions based upon the results of this study are as follows:

- * Using bicycles instead of automobiles for short trips can conserve significant amounts of petroleum products and energy.
- * If adequate safe bikeways, including secure parking areas, were provided, a significant proportion of commuters could be induced to substitute bicycle use for automobile transportation during part of the year.
- * There is public interest in and support for expanded bikeway systems in each of the thirteen largest cities of Montana.
- * An estimated two-thirds of Montana automobile drivers own and/or ride bicycles.
- * There is a perceived need for more information and training relative to bike use and safety and in stronger law enforcement of regulations pertaining to bicycle use.

RECOMMENDATIONS

Based upon the findings of this study, the following recommendations are made:

- * That an expanded program for the development of adequate bikeways in the cities of Montana be implemented as a method of conserving energy.
- * That commuters, shoppers, and others be encouraged to utilize bicycles for short trips rather than resorting to the use of automobile transportation.
- * That increased training and information on bicycle safety be disseminated to all ages of cyclists in Montana.
- * That a campaign for driver awareness of cyclists be instituted to aid in making bicycling safer.
- * That local and state law enforcement officials be enlisted to strengthen the enforcement of laws affecting bicycle use and safety.

APPENDIX A

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APPENDIX B

MONTANA ENERGY CONSERVATION -- PUBLIC OPINION POLL

Please answer the following questions by checking the appropriate spaces.

City _____

		YES	NO	
1. Do you live in the city limits?		_____	_____	1
2. Do you have a current Montana driver's license?		_____	_____	2
3. Do you drive to and from work?		_____	_____	3
4. Do you participate in a car pool in going to and from work?		_____	_____	4
5. What is your age range?	under 20 21-40 41-60 over 60	_____ _____ _____ _____	_____ _____ _____ _____	5
6. Do you usually ride a bicycle to work? for recreation?		_____ _____	_____ _____	6
7. Would you support the development of bikeways in your community?		_____	_____	7
8. Would you support the use of streets with areas specially designated for bicycles?		_____	_____	8
9. If there were more bikeways, would you ride a bicycle to work more?		_____	_____	9
10. Do you see yourself riding a bike more in the next 5 years?		_____	_____	10
11. Do you think the state's current investment in bikeways is:	too much about right too little	_____ _____ _____	_____ _____ _____	11
12. Would you support using state road construction and maintenance funds to build and maintain bikeways?		_____	_____	12
13. Are bike safety information and training adequate in this city?		_____	_____	13
14. Would you support law enforcement of regulations on bike use?		_____	_____	14
15. What is the state law for turning right on a red light?	prohibited generally permitted permitted by sign only	_____ _____ _____	_____ _____ _____	15
16. When it is possible to turn right on a red light, how often do you do it?	hardly ever sometimes most of the time	_____ _____ _____	_____ _____ _____	16
17. Do you feel that making a right turn on a red light saves gasoline?		_____	_____	17
18. Do you feel that permitting right turns on red is dangerous to you:	as a driver as a pedestrian	_____ _____	_____ _____	18
19. Are you ever pressured into making a right turn on red by impatient drivers behind you?	frequently occasionally never	_____ _____ _____	_____ _____ _____	19
20. How do you feel about the state law for right turn on a red light?	support it neutral opposed	_____ _____ _____	_____ _____ _____	20

THANK YOU FOR YOUR TIME AND COOPERATION

APPENDIX C

DISTRIBUTION OF RESPONSES TO PUBLIC OPINION POLL QUESTION 4

Do you participate in a car pool in going to and from work?

POPULATION OF CITIES	AGE OF RESPONDENT											
	UNDER 20			21-40			41-60			OVER 60		
	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
Over 60,000	0	121	121	1	178	179	10	149	159	7	100	107
20,000 - 60,000	9	105	114	54	241	295*	51	200	251	33	95	128
10,000 - 20,000	4	141	145	22	241	263	15	259	274	0	127	127
8,000 - 10,000	2	114	116	0	140	140	10	181	191	13	96	109
6,000 - 8,000	0	75	75	0	177	177	13	266	279	8	221	229
TOTALS	15	556	571	77	977	1054*	99	1055	1154	61	639	700
										252	3227	3479*

* 1 person did not respond to this question.

DISTRIBUTION OF RESPONSES TO PUBLIC OPINION POLL QUESTION 6a

Do you usually ride a bicycle to work?

POPULATION OF CITIES	AGE OF RESPONDENT														
	UNDER 20			21-40			41-60			OVER 60			TOTALS		
	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
Over 60,000	2	119	121	19	160	179	8	151	159	13	94	107	42	524	566
20,000 - 60,000	24	90	114	29	267	296	10	241	251	0	128	128	63	726	789
10,000 - 20,000	17	128	145	19	244	263	12	262	274	0	127	127	48	761	809
8,000 - 10,000	0	116	116	16	124	140	0	191	191	0	109	109	16	540	556
6,000 - 8,000	5	70	75	0	177	177	1	278	279	0	229	229	6	754	760
TOTALS	48	523	571	83	972	1055	31	1123	1154	13	687	700	175	3305	3480

DISTRIBUTION OF RESPONSES TO PUBLIC OPINION POLL QUESTION 6b

Do you usually ride a bicycle for recreation?

POPULATION OF CITIES	AGE OF RESPONDENT											
	UNDER 20			21-40			41-60			OVER 60		
	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
Over 60,000	103	18	121	159	20	179	136	23	159	24	83	107
20,000 - 60,000	112	2	114	248	48	296	174	77	251	2	126	128
10,000 - 20,000	125	20	145	244	19	263	211	63	274	71	56	127
8,000 - 10,000	89	27	116	110	30	140	79	112	191	32	77	109
6,000 - 8,000	72	3	75	99	78	177	199	80	279	53	176	229
TOTALS	501	70	571	860	195	1055	799	355	1154	182	518	700
										2342	1138	3480

DISTRIBUTION OF RESPONSES TO PUBLIC OPINION POLL QUESTION 7

Would you support the development of bikeways in your community?

POPULATION OF CITIES	AGE OF RESPONDENT											
	UNDER 20			21-40			41-60			OVER 60		
	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
Over 60,000	118	3	121	173	6	179	159	0	159	107	0	107
20,000 - 60,000	113	1	114	296	0	296	245	6	251	128	0	128
10,000 - 20,000	145	0	145	263	0	263	269	5	274	109	18	127
8,000 - 10,000	116	0	116	139	1	140	179	12	191	106	3	109
6,000 - 8,000	75	0	75	177	0	177	270	9	279	216	13	229
TOTALS	567	4	571	1048	7	1055	1122	32	1154	666	34	700
										3403	77	3480

DISTRIBUTION OF RESPONSES TO PUBLIC OPINION POLL QUESTION 9

If there were more bikeways, would you ride a bicycle to work more?

POPULATION OF CITIES	AGE OF RESPONDENT														
	UNDER 20			21-40			41-60			OVER 60			TOTALS		
	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
Over 60,000	89	32	121	140	39	179	109	50	159	11	96	107	349	217	566
20,000 - 60,000	85	29	114	228	68	296	173	78	251	47	81	128	534	255	789
10,000 - 20,000	126	19	145	168	95	263	152	122	274	35	92	127	484	325	809
8,000 - 10,000	102	14	116	121	19	140	128	63	191	88	21	109	430	126	556
6,000 - 8,000	54	21	75	95	82	177	143	136	279	7	222	229	298	462	760
TOTALS	456	115	571	752	303	1055	705	449	1154	188	512	700	2101	1379	3480

DISTRIBUTION OF RESPONSES TO PUBLIC OPINION POLL QUESTION 10

Do you see yourself riding a bike more in the next 5 years?

POPULATION OF CITIES	AGE OF RESPONDENT														
	UNDER 20			21-40			41-60			OVER 60			TOTALS		
	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
Over 60,000	104	17	121	170	9	179	130	29	159	11	96	107	415	151	566
20,000 - 60,000	104	6	110*	248	47	295*	208	43	251	47	81	128	607	177	784*
10,000 - 20,000	125	20	145	249	14	263	210	64	274	41	86	127	625	184	809
8,000 - 10,000	116	0	116	134	6	140	134	57	191	27	82	109	411	145	556
6,000 - 8,000	61	14	75	137	40	177	204	75	279	38	191	229	440	320	760
TOTALS	510	57	567*	936	117	1053*	885	269	1154	164	536	700	2498	977	3475*

* 5 people did not respond to this question.

DISTRIBUTION OF RESPONSES TO PUBLIC OPINION POLL QUESTION 13

Are bike safety information and training adequate in this city?

POPULATION OF CITIES	AGE OF RESPONDENT														
	UNDER 20			21-40			41-60			OVER 60			TOTALS		
	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
Over 60,000	6	115	121	0	179	179	0	159	159	0	107	107	6	560	566
20,000 - 60,000	8	106	114	0	296	296	2	249	251	0	128	128	10	779	789
10,000 - 20,000	3	142	145	5	258	263	0	274	274	1	126	127	9	800	809
8,000 - 10,000	0	116	116	5	135	140	0	191	191	4	105	109	9	547	556
6,000 - 8,000	0	75	75	0	177	177	0	279	279	2	227	229	2	758	760
TOTALS	17	554	571	10	1045	1055	2	1152	1154	7	693	700	36	3444	3480

DISTRIBUTION OF RESPONSES TO PUBLIC OPINION POLL QUESTION 14

Would you support law enforcement of regulations on bike use?

POPULATION OF CITIES	AGE OF RESPONDENT											
	UNDER 20			21-40			41-60			OVER 60		
	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
Over 60,000	115	6	121	179	0	179	159	0	159	107	0	107
20,000 - 60,000	107	7	114	296	0	296	249	2	251	128	0	128
10,000 - 20,000	133	12	145	263	0	263	272	2	274	119	6	125*
8,000 - 10,000	116	0	116	130	10	140	183	8	191	85	24	109
6,000 - 8,000	73	2	75	177	0	177	273	6	279	214	15	229
TOTALS	544	27	571	1045	10	1055	1136	18	1154	653	45	698*
										3378	100	3478*

* 2 people did not respond to this question.

APPENDIX D



Capitol Station, Helena, Montana 59601
HIGHWAY TRAFFIC SAFETY DIVISION

March 15, 1979

Subject: Request for Bikeway
Information

Dear Sir:

The Highway Traffic Safety Division of the Montana Department of Community Affairs (DCA) is requesting information concerning existing and long-range plans for bikeways in the largest thirteen (13) cities in Montana.

We would appreciate your office supplying Highway Traffic Safety Division with any available information including map, drawings, etc., regarding existing and future bikeway plans for your community. If there is a charge for this information and/or related documents, please send the bill with your return transmittal.

This information will be used in conjunction with a proposed study concerning the current and long-range energy conservation potential of the bicycle. Other areas of concern which might be incorporated into the study will relate to current needs and safety along with future convenient operation of the bicycle as related to transportation and recreation.

If you have any questions and/or comments regarding this request, please contact Mr. Harry Lauer at 449-3412.

Thank you for your time and efforts regarding the subject request.

Sincerely,

Albert E. Goke
Administrator
Highway Traffic Safety Division



Billings, Montana

Comprehensive Bikeway Plan



May 1975

The Honorable Joseph A. Leone
Mayor, City of Billings
City Hall
Billings, Montana 59101

Dear Mr. Mayor:

We are pleased to submit The Comprehensive Bike-way Plan to the City of Billings.

This document will provide the city with the necessary background and technical data to proceed toward actual implementation of the Bike-ways.

Our office has appreciated the opportunity to work with you, the city departments, and the people of Billings in achieving this plan.

Respectfully submitted,

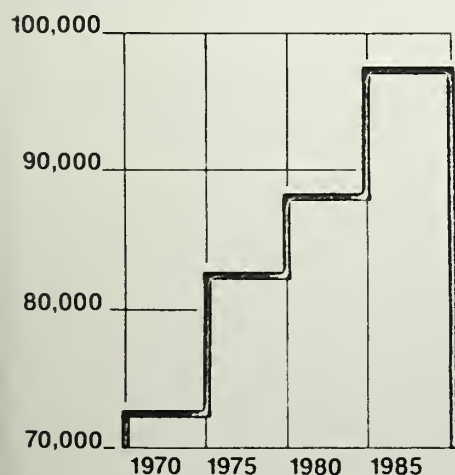
Michael E. Potter
Landscape Architect

MEP/lp

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4	BILLINGS BIKEWAY STUDY
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17	BILLINGS SURVEY
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PROJECTED POPULATION BILLINGS URBAN AREA



Introduction

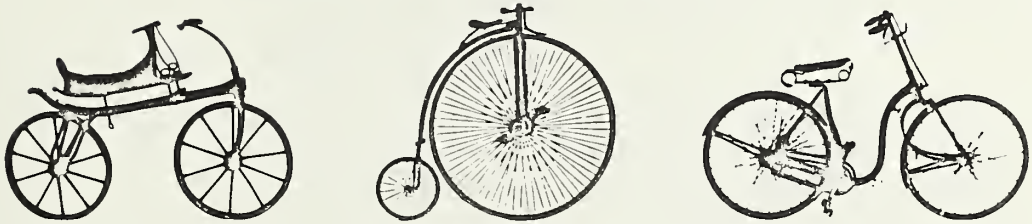
This study acknowledges the nationwide and immediate citywide increase in bicycling popularity and recognizes the potentiality of the bicycle as a viable alternate mode of transportation for the Billings area.

All indications are that bicycling will continue to gain in popularity. Environmental awareness, health, consciousness, and the need for less expensive and energy conserving transportation modes will continue to stimulate increased use for both transportation and recreation.

Increased bicycle use will also increase the potential for bicycle accidents. The need for safe and efficient Bikeway facilities within the Billings area is clearly evident and will become more urgent as the population grows and proportionately more people make use of bicycles.

Historic Perspective

Since the time of ancient Egypt and Rome there is evidence of wheeled vehicles that resemble the bicycle. A variety of two wheeled "coaster" type vehicles evolved at the turn of the 18th century. The "granddaddy" of today's bicycles emerged after the Civil War.



Rotary cranks with pedals were fixed to the hub of a large front wheel. "Pedal power" had begun. Technical improvements led to the "Ordinary" a high front wheeler that became the symbol of the "Gay Nineties." The Ordinary was soon outmoded by a lower and safer bicycle with equal sized wheels. The "Safety" model was fitted with pneumatic tires and subsequently became a viable and popular mode of transportation throughout Europe and America.

As the bicycle gained popularity in the United States, bicyclists began to demand and obtain better roads upon which to ride. The League of American Wheelmen was organized in 1880. This group spearheaded efforts to improve bicycle facilities such as paved streets and street lighting.

The paved bicycle roadways, bicycle technology and bicycle mass production methods contributed to the concept and subsequent reality of the mass-produced automobile. Convenience, carrying capacity and popularity led to wide acceptance of the auto and almost total elimination of the bicycle as a transportation mode in America.

The bicycle in the U. S. has served primarily for transportation and recreation for children since the advent of the automobile. Brief resurgences of bicycle usage during the Depression and World Wars were evident but shortlived, how-



ever, because fuel shortages and need for low cost transportation were only temporary.

Internationally, the bicycle has historically retained more popularity as a mode of transportation. Cycle paths separated from vehicular traffic have been retained, used, improved and expanded. Over the years, many European new towns have incorporated cycle paths into community circulation systems. In the Netherlands it is reported that there are eight million bicycles in a country of 13 million people. Within the urban areas of the Netherlands, 70 percent of the traffic movement is by bicycles and pedestrians.

In the early 60's a demonstration Bike Route in Homestead, Florida rekindled interest in other U. S. communities in the development of facilities for bicyclists. The Bicycle Institute of America developed a public awareness program that emphasized the benefits of bicycling and promoted the development of Bicycle Paths.

Since the early 60's a number of U. S. communities have developed facilities for bicyclists that have proved very functional and popular for not only physical fitness and recreation but also transportation.

BICYCLE-AUTOMOBILE SALES COMPARISON

YEAR	 MILLIONS	 MILLIONS
1960	3.7	
1965	5.6	
1968	7.5	10.0
1969	7.1	9.7
1970	6.9	8.1
1971	8.9	10.7
1972	13.7	11.0
1973	15.3	11.4

Figures from The National Recreation and Park Association

The recent and current growth of bicycling in the U. S. is phenomenal. It is reported that half of the 210 million people in the U. S. are bicycle riders. Bicycling has grown faster than any other participating recreation activity in this country. A realistic estimate of active bicyclists in a given area is 30 percent of the population. This percentage figure will increase, however, where well-planned bicycle facilities are provided and where environmental characteristics such as suitable climate and flat terrain provide bicycling opportunities.

The bicycle has stood the test of time. Today there are over 100 million people riding bicycles of all types in the U. S. Their reasons for riding are varied. It is enjoyable and relaxing to ride a bike. It is ecologically sound to ride a bike. And it is indisputably a very economical form of transportation that can provide an easier way to get from place to place if proper facilities are provided.

Billings Bikeway Study

BACKGROUND

Since the early 1960's, interest in bicycling has been evident in the City of Billings. The Parks and Open Space Study of the 60's addressed the need for Bike Paths within the city parks and need for linear parks with Bike Paths to interconnect large park areas and provide bicycle access to and from the parks.



In 1972 the Billings Parks Department proposed a scenic Bike Path along the Yellowstone River and on top of the Rimrocks. In 1973, a local college student recommended a preliminary network of Bike Routes for Billings. These studies and increased bicycle usage within the Billings area have stimulated interest and enthusiasm for bicycle facilities.

In response to the increasing demand and enthusiastic tempo for bicycle facilities this study was prepared.

PLANNING METHODOLOGY

The planning process followed a logical sequence of events leading to this report. The process began with a research phase that involved six areas of concern.

REVIEW OF STUDIES

Numerous reports and plans for bicycle facilities throughout the country and design guideline reports were collected, read and analyzed. Information considered pertinent to the Billings study was extracted and recorded.

CITY INPUT

City departments were involved in pre-design discussions of the bicycle facilities. Departmental input and design comments were incorporated into the planning process at the outset.

PUBLIC INPUT

Meetings were announced and held with local Bike Clubs and other interested groups to stimulate direct public input into the planning process.

PUBLIC SURVEY

A survey was printed in the local newspaper to derive basic user preferences and demand characteristics for the bicycling facilities. The survey response was evaluated, condensed and used in the planning process.

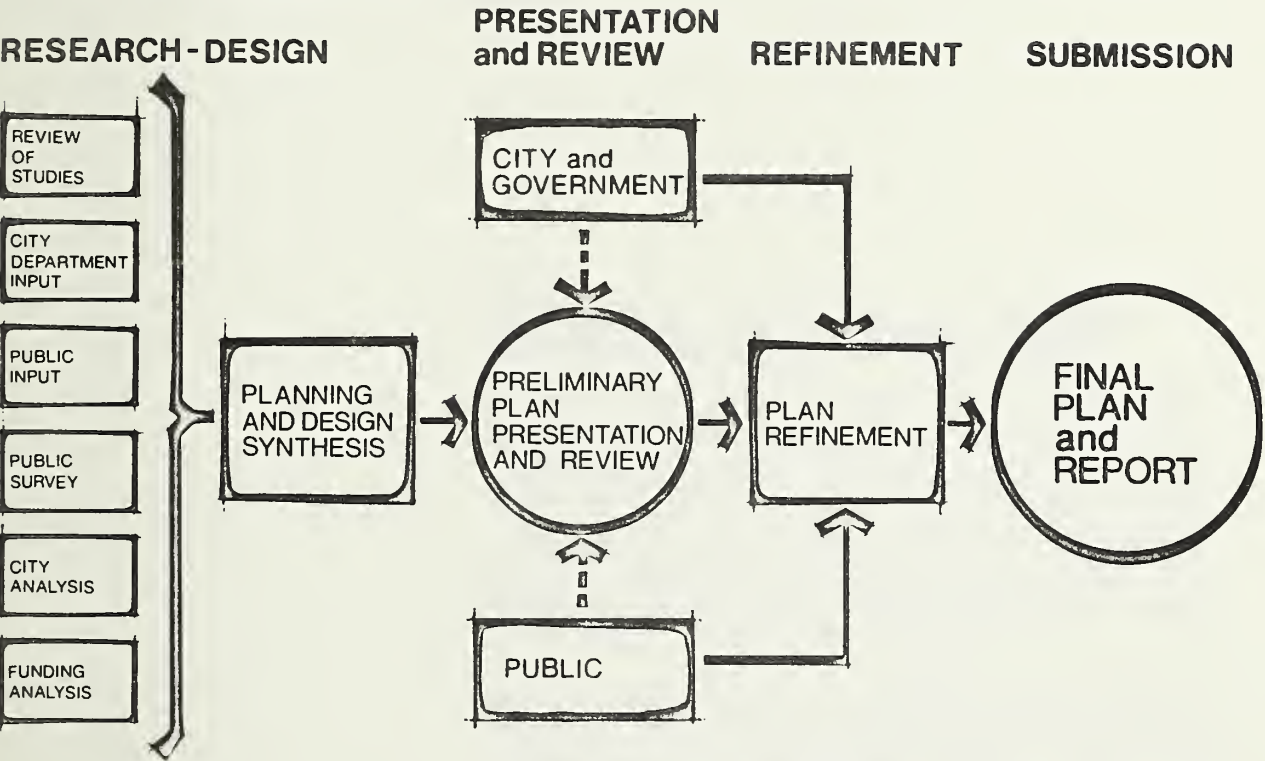
CITY ANALYSIS

A detailed site analysis of the Billings area was accomplished to define bicycling facility opportunities and constraints. This analysis included the on-site evaluation of streets, alleyways, easements, rights-of-way, park and open space areas. This information was condensed into work sheet overlays for use during the planning process.

FUNDING ANALYSIS

Federal, State and local sources of funding were investigated and defined for the bicycling facilities.

METHODOLOGY CHART



PLANNING and DESIGN

The actual planning and design process involved the synthesis of the information compiled during the research phase into a preliminary plan.

PRESENTATION and REVIEW

The preliminary plan was presented to the city departments, commissions, and public for review and input.

REFINEMENT

Following the review process the plan was refined, periodically reviewed, and prepared for final submission to the city.

FINAL PLAN and REPORT

The Final Plan and Report is a document that condenses the full content of the planning process into a concise information source and recommends a course of action for the City of Billings regarding bicycling facilities.

State of the Art

With the accelerated growth in bicycling popularity and utilization have come demands for recreational and utility oriented facilities. These facilities are needed not only to accommodate efficient movement but also provide for the safe movement of bicyclists. It has been proven elsewhere that proper design practices can promote safety and utility.

The conflict between automobile and bicycle traffic, however, is a recognized fact of life. Shared space for vehicular traffic and bicycle traffic must be arranged to minimize conflicts.



It is also a recognized fact that recreational bicycling and utility or commuter bicycling can be accommodated with the same facility. This dual purpose is especially realistic for urban situations such as the Billings area.

BIKEWAY

"Bikeway" is a term that refers to any and all types of facilities that are designed for and provide for bicycle travel.



Bike Path • independent



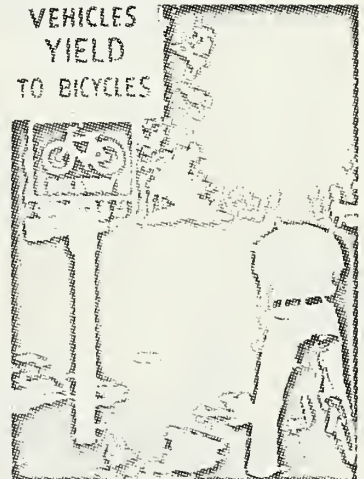
Bike and pedestrian underpass



Bike Path
separated from traffic



Bike Lane in Seattle



Bike Route • yield type

CLASSIFICATIONS

Three classifications for Bikeways and variations of each are recognized as national standards (nomenclature varies), have been used effectively in other American cities, are consistent with the Montana Department of Highways' Guidelines, and are considered valid for the Billings Bikeway System. Such a spectrum provides a realistic design solution for almost any anticipated situation along a preferred alignment.

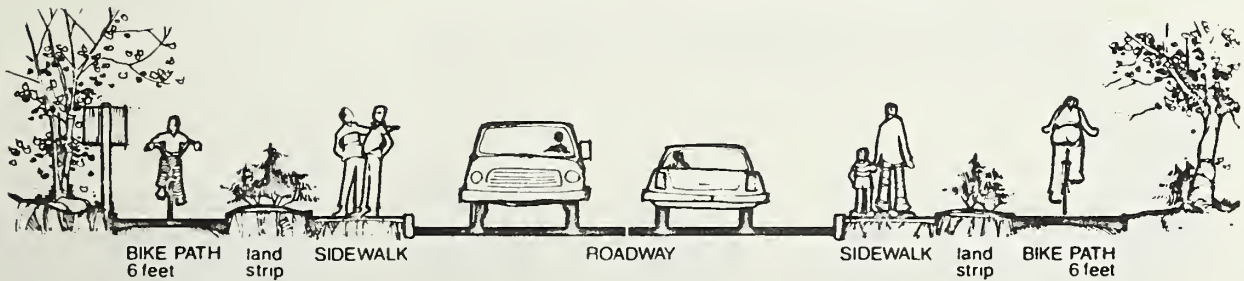
Bike Path - Class I

Bike Paths are designated rights-of-way separated from vehicular traffic except for cross flows and some pedestrian use.

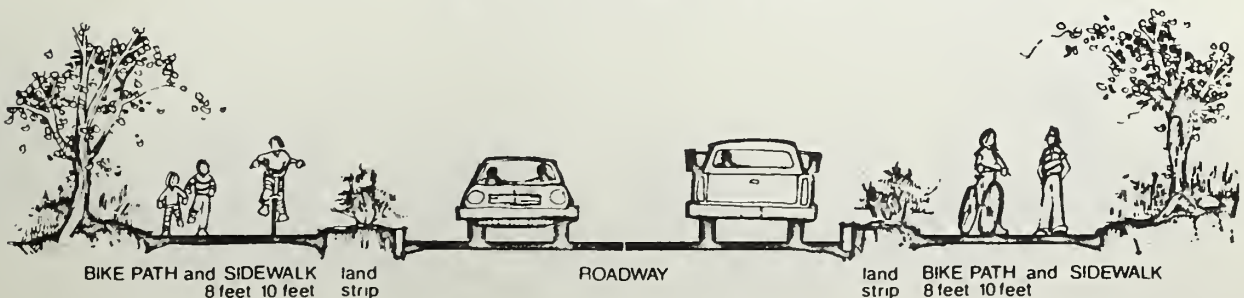
a. INDEPENDENT



b. SEPARATED FROM PEDESTRIANS



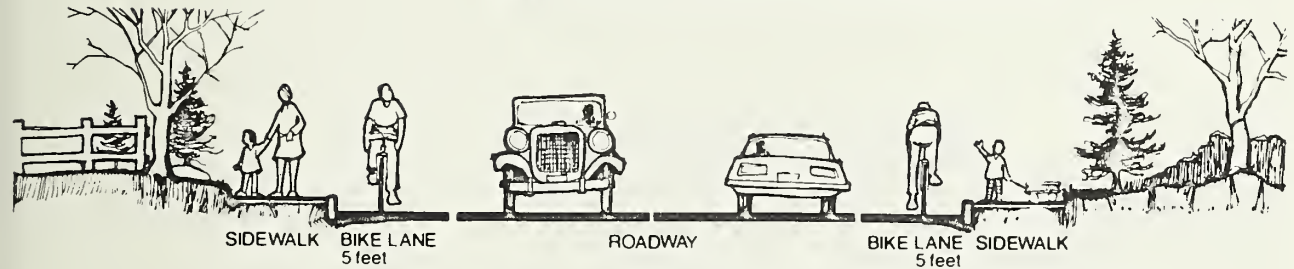
c. SHARED WITH PEDESTRIANS



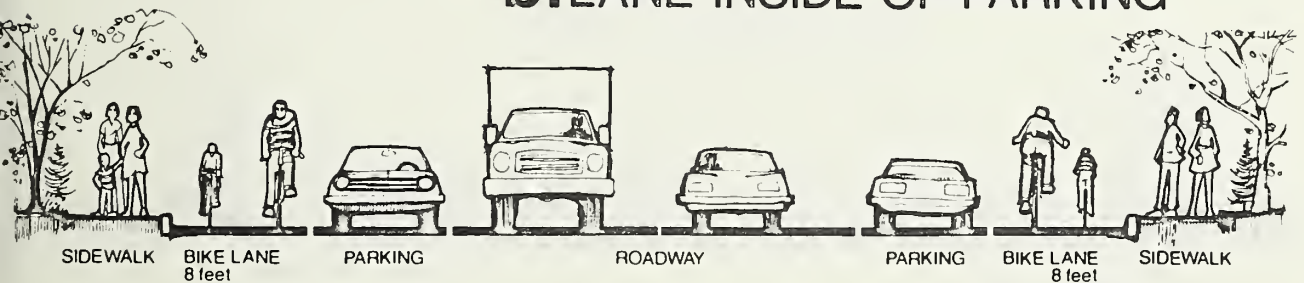
Bike Lane-Class II

Bike Lanes are shared segments of streets for the exclusive use of bicycling except for cross flows. These lanes can be separated from traffic by painted stripes or more effectively from a safety standpoint by low barriers.

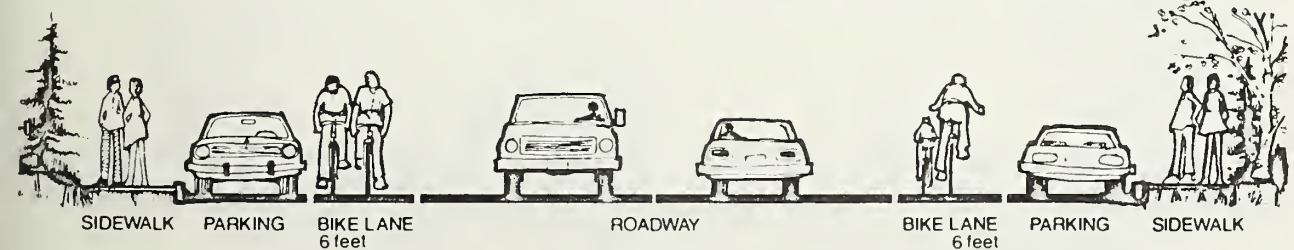
a. PARKING PROHIBITED



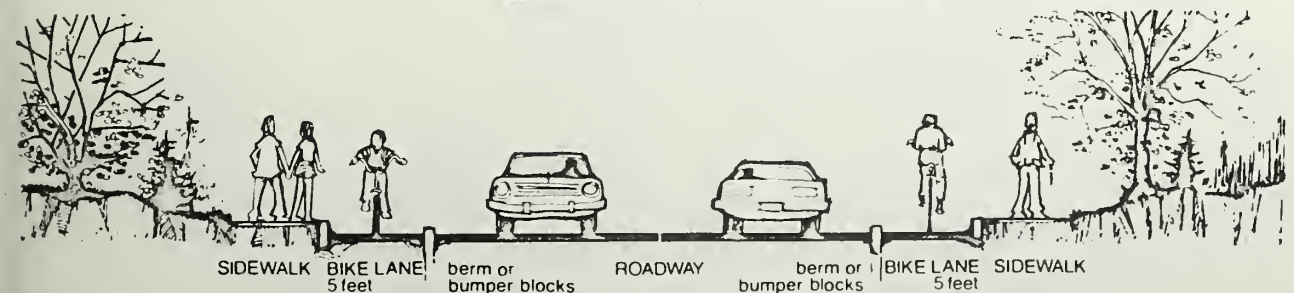
b. LANE INSIDE OF PARKING



c. LANE OUTSIDE OF PARKING



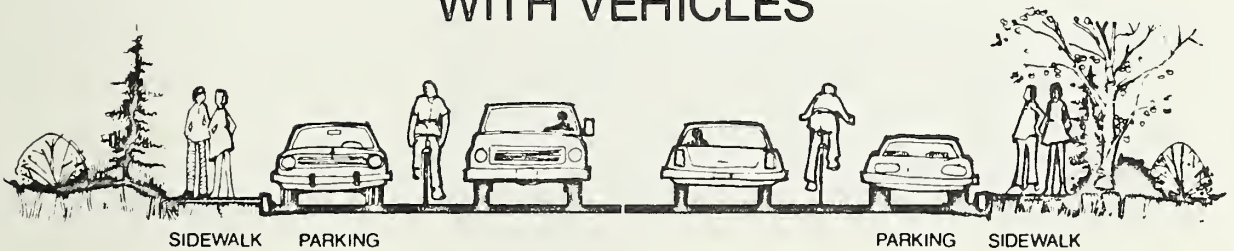
d. PHYSICAL SEPARATION



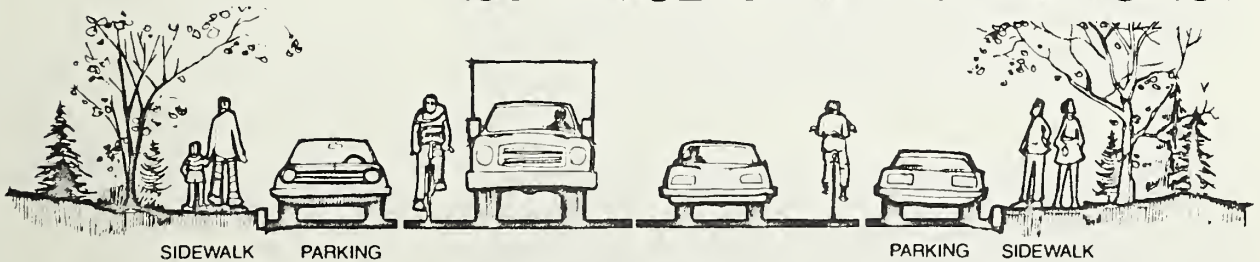
Bike Route·Class III

Bike Routes are designated streets that the bicyclist and motorist share. Signing or stenciling on the pavement denotes route locations.

a. BICYCLIST COMPETES WITH VEHICLES



b. VEHICLES YIELD TO BICYCLIST



c. DEDICATED FOR BICYCLING (limited vehicle access)



DISCUSSION

The BIKE PATHS are by far the safest form of Bikeway. They are also the most expensive. This type of facility is often located in park areas, along easements in new developments, or in rural areas or parallel to streets. In some instances the Bike Path may also serve non-motorized recreation such as jogging, cross country skiing in the winter, and some pedestrian movement.

Experienced bicyclists often react negatively to the construction of Bike Paths. The experienced utilitarian bicyclists want a direct route and do not want to be limited to an indirect route.

BIKE LANES are typically separated from traffic by a painted stripe that provides a psychological separation. Such lanes are referred to as "unprotected" or "secondary." Bike Lanes can be separated by median buffer landscaping, concrete bumper stops, or other physical means. This type of lane is described as "protected" or "primary."

Bike Lanes function well and are less expensive than Bike Paths. Existing streets can be adapted where adequate width is available and the design of new streets can easily accommodate Bike Lanes.

BIKE ROUTES are signed to encourage bicyclists and warn motorists of anticipated bicyclists on the street. These are the least expensive type of Bikeway, but do not function well unless auto traffic is restricted.

In some cases Bike Routes have been very effective where vehicular traffic must yield to the bicyclist or where a total street segment is dedicated for bicycling but service vehicle and owner access is allowed. The vehicular limitations on specially designated Bike Routes must be enforced to allow proper function of such a facility.

DESIGN STANDARDS

LENGTH STANDARDS

Bikeways should be of adequate length and located to allow bicycle access from residential origins to major destinations such as city parks, colleges, schools, etc. Short segments under a mile can be effective in close proximity to major magnets. Segments of a few miles, however, are desirable to maintain the bicycling public's interest, provide for recreational riding and to maximize origin destination opportunities.

DIMENSIONAL REQUIREMENTS

Four feet is considered to be the minimum acceptable dimension for Bike Path traffic moving in one direction. A paved width of six feet with one foot of additional cleared shoulder space on each side is necessary for two directional bicycle traffic. Many U. S. cities have adopted standards calling for eight foot pavement width on Bike Paths. Additional width is recommended for more heavily used areas where bicyclists are apt to ride side by side. If pedestrians and bicyclists share a Bike Path, it should be at least ten feet wide.

Bike Lanes located on both sides of the street between the curb line and traffic lane should be at least five feet wide. Bike Lanes on each side of the street have proved functional at six feet in width when spaced between parked vehicles and traffic lanes. When located between curb or edge of pavement and parked vehicles, eight feet in width is needed.

VERTICAL and HORIZONTAL ALIGNMENT

The less physical energy expended on a bicycle to accommodate a Bikeway the more usable it is. Where Bikeways follow an existing road profile there is little opportunity to adjust the vertical alignment. Areas of very steep slopes, however, should be avoided if possible.

Zero to three percent slopes are excellent for Bikeway development. Three percent to five percent slopes are acceptable with short segments between five and ten percent permissible.

VERTICAL CLEARANCE

10 feet desirable
8 feet minimum



2 feet for
PEDESTRIANS

WIDTH CLEARANCE

ONEWAY · 6 feet desirable
4 feet minimum

TWOWAY · 8 feet desirable
6 feet minimum

Negotiation of the horizontal alignment or curvature of Bikeways is dependent on bicycle speed. The average bicycling speed along a level Bikeway is reported to be ten miles per hour. This speed can increase on downhill segments. The formula derived for determining simple curves is $R \text{ (radius)} = 1.25V \text{ (velocity)} + 1.4$. The comfortable radius for a bicycle traveling at ten miles per hour is 14 feet based on application of the formula.

Highway and street horizontal alignments designed for vehicular traffic usually exceed the requirements of the formula and are more than adequate for the bicyclist.

INTERSECTIONS

Intersections of roadways on which Bike Lanes and Bike Routes are provided are areas of greatest potential conflict for bicyclists. Motorist and pedestrian on grade intersections of roadways and Bike Paths are of equal concern. The degree of conflict depends on the numbers of bicyclists, amounts of vehicular and pedestrian traffic and directional flow of each.

Each intersection warrants individual study to determine the safest and most functional design solution. Traffic directors, cautionary lighting, crosswalks or grade separator alignments can be considered as per given situation. Curb cuts are essential to allow the smooth flow of bicycles from Bike Paths onto street sections.

CONSTRUCTION STANDARDS

Bikeways function well on a smooth and stable hard surfaced base. Quality streets exceed the structural section required for Bikeways. A compacted four inch base of gravel with two inches of asphaltic concrete will usually suffice for independent Bike Paths.

Surface drainage of 1/4" per foot is recommended for Bikeways. Drainage ditches or subsurface drainage facilities should be provided to remove the runoff.

Drainage grates along Bike Lanes or Bike Routes can be a serious problem for the bicyclist. Many typical drainage grates can entrap a bicycle wheel and result in serious injury to the bicyclist. Safety grating should be employed where possible and appropriate markings should be used to call attention to hazardous grates that cannot be redesigned or replaced because of hydrodynamic considerations.

Clear delineation of Bikeways is essential to assure proper use and encourage safety. Signing, pavement striping, and physical barriers can be used per segment according to design needs. The National Manual for Uniform Traffic Control Devices includes standard signs for this purpose. Special informational signing may be necessary, however, to advise or caution bicyclists and should be designed accordingly.

Street lighting will usually provide enough illumination for the bicyclists. Areas where heavy bicycle traffic is anticipated at night should be studied and additional lighting installed to eliminate dark spots.

Lighting of independent Bike Paths warrants thorough study. Use characteristics, alignment, surrounding land uses, and aesthetics should be thoroughly considered.

SPECIAL FACILITIES

Destination facilities should be made available at needed locations along the Bikeways. These facilities include rest area shelters, terminal locker facilities, and bike racks.

COSTS

Construction costs for the implementation of the different Bikeway options vary considerably. Generally, however, the Bike Paths are usually the most expensive because they involve initial construction or substantial reconstruction of existing facilities. Bike Lanes are less expensive because they involve the adaption of existing streets. Bike Routes are least expensive from a construction standpoint because they usually involve little more than signing.

The following guideline costs for the three general types of Bikeways were developed based on the interpretation of cost information from other cities and the analysis of the Billings area construction costs. These total costs per mile would include anticipated design fees, construction of the facility, striping and signing.

These figures are "ball park" estimates and should be used only for general estimating purposes:

BIKE PATHS Class I

New Facility	\$40,000-\$50,000/mile
Reconstructed Sidewalk	\$30,000-\$40,000/mile

BIKE LANES Class II

With Parking	\$ 6,000-\$ 8,000/mile
Parking Removed	\$ 8,000-\$10,000/mile

BIKE ROUTES Class III

Without Vehicular Restrictions	\$ 3,000-\$ 4,000/mile
With Vehicular Restrictions	\$ 4,000-\$ 6,000/mile

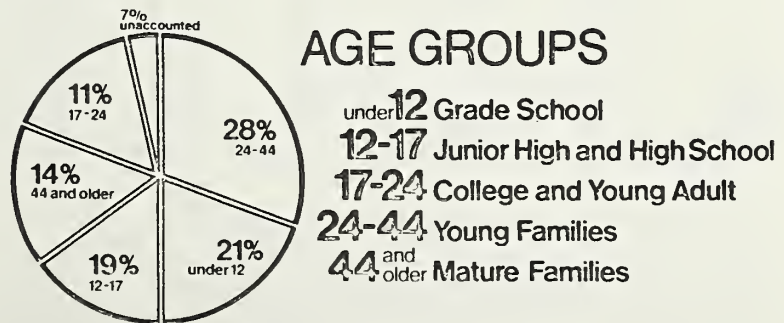
It should be emphasized that these costs do not include provision for major structures such as Bikeway overpasses or underpasses or land acquisition costs. The cost may also vary depending on severe construction difficulties or major facility revisions needed such as repaving Bike Lanes.

Billings Survey

A survey concerning bicycling facilities for Billings was conducted to determine public attitudes, demand characteristics, preferred destinations, and gave those interested an opportunity to express their ideas or concerns.

There were 288 responses to the Billings Bikeway Survey that was printed in the Billings Gazette on September 20, 1974. This response represented 866 bicyclists. (See Appendix A.)

Of the total responses, only two of the returned forms were negative or skeptical. Although this survey could interject a bias favoring positive feedback, respondents were given the opportunity to react either way.



Nearly 40 percent of the bicyclists represented in the survey were 17 years of age or younger. Of these, over 21 percent or nearly one-fourth were age 12 or younger. The largest segment, 28 percent, of respondents were over 24 years of age.

A frequency factor giving relative values to the frequency of bicyclists per given destination, shows city parks as being the number one destina-

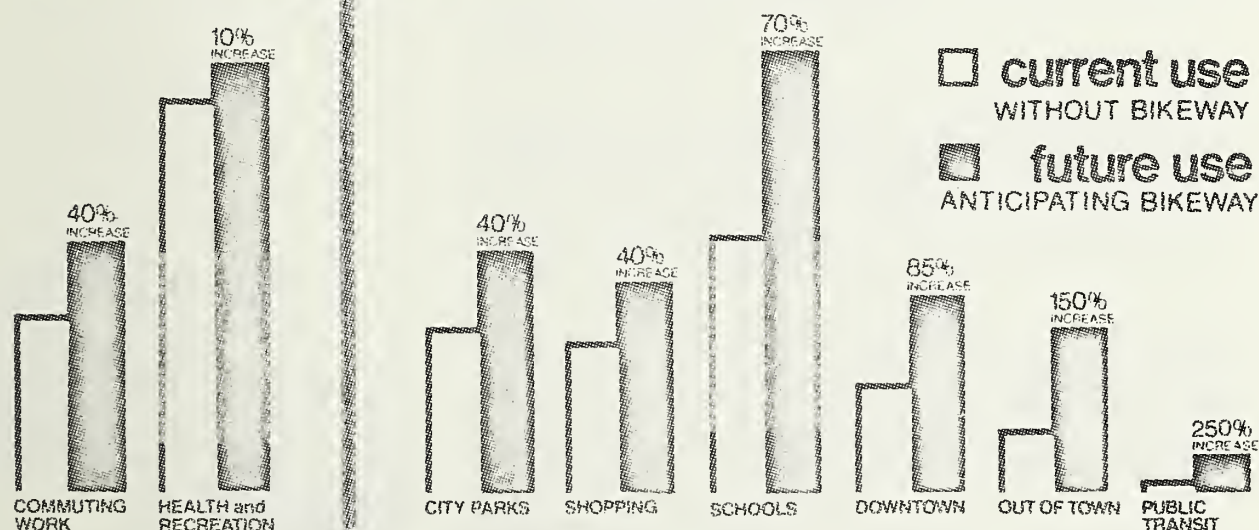
tion point, followed by shopping centers and elementary schools. If elementary and secondary schools are combined it is by far the highest frequency of bicyclists for a specific destination.

The downtown area as a point of destination ranked fourth, followed by the Billings colleges. The college campuses involve a relatively small percentage of the city's total population. College bicyclists would probably show a higher proportion of biking activity than most population categories.

Trips out of town; west of Shiloh Road, to the Yellowstone River, and to the top of the Rimrocks, ranked sixth and public transit stops ranked last in order of priority.

BICYCLE TRIP RATIOS

general use specific use



The age categories are another set of statistics that must be qualified. While the 25 to 44 age group has the largest number of bike riders, this group also represents an age span of 19 years and the largest segment of the surveyed population.

In addition to relatively specific destinations, the non-specific categories loosely labeled "work" and "recreation" are given to compare biking objectives. The responses show that bikers pedal over twice as frequently for recreation than to work. Again, some rationalization is due. Standard commuting times compel the majority of work bound bicyclists to compete

with rush hour vehicular traffic on at least one segment of their routes. The inequalities of bicycle versus automobile on our existing streets is enough to discourage all but the more determined bikers. The same rationale would apply to children biking to school, except that many of the bike riding children who are too far to walk, but too close to be bused to school do not have the choice of commuting by car.

A large number, or about two-thirds, of the questionnaires were returned with comments, and suggestions. For example, several respondents suggest that buses have external bike racks so they could combine the advantages of the two modes of transportation.

The most popular suggestion, referred to by 27 respondents, deals with the desire or expressed need to segregate Bike Paths from vehicular traffic. This is followed closely by 26 suggestions for drinking fountains, 21 for sheltered rest areas, 19 for bike racks, etc.

However, references to safety were given in specific categories, including the segregation of vehicular traffic, lights along the paths, bike use and safety instruction, and several others. If combined, all references to safety comprise the overwhelming biking concern with over 100 comments and suggestions.

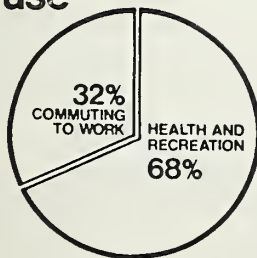
The overwhelming attitude toward the survey was positive. The respondents indicated the need and desire for Bikeways within Billings. The respondents indicated nearly a two-fold increase in all specific categories of usage if proper bicycling facilities are provided.

A trend toward more balanced recreation and commuting usage was indicated assuming the availability of Bikeway facilities. This trend seems consistent with other cities that have shown a marked increase in commuter usage upon implementation of Bikeway systems.

BICYCLE USE

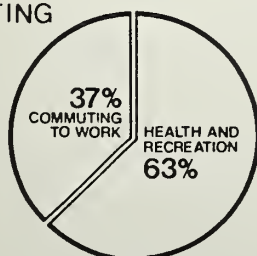
current use

WITHOUT
BIKEWAY



future use

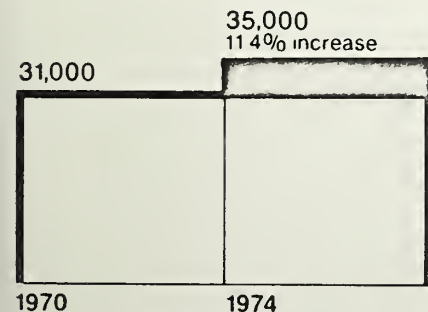
ANTICIPATING
BIKEWAY



Design Rationale

The nationwide trend toward bicycling can also be clearly seen in the Billings area. The demonstrated demand is obvious. Bicyclists are evident pedaling throughout the community during most of the year. Row upon row of bicycles can be seen at the grade schools and junior high schools. Bicycle traffic around and within city parks has been observed throughout the city.

BILLINGS AREA BICYCLISTS TOTAL



Bicycle sales have soared in recent years in Billings. There are approximately 35,000 bicycles within the Billings area which is consistent with the national average of one bike per every three people.

Along with the increase in bicycling use in Billings, there has been strong public pressure on the city to provide facilities. Implementation of Bikeway facilities must be approached realistically so that the needs of the bicycling public as well as the general public are met.

The Bikeway facilities should be aligned to provide:

1. ACCESS to preferred bicycling destinations.
2. SAFETY for bicyclist as well as motorist.
3. CONTINUITY of bicycling facilities within the Billings area.

ACCESS

Essential to the success of a Bikeway facility is an alignment that goes where bicyclists want to go. Although a Bikeway may in itself stimulate new usage or redirect bicycling traffic flows, it has been experienced elsewhere that direct routes to desired destinations draw repeated bicycle usage.

Bikeway facilities should provide access from residential areas to major dispersed bicycling destinations throughout the city including:

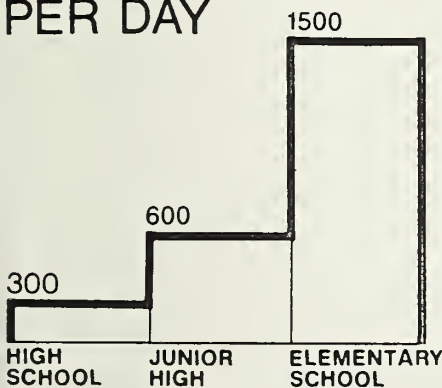
1. Schools
2. Parks
3. Shopping Centers

and other specific points of destination including:

1. The Central Business District
2. Eastern Montana College
3. Rocky Mountain College
4. The Metra Center
5. Yellowstone County Fairgrounds
6. The Yellowstone River
7. The Rimrocks
8. West of Shiloh Road

These destinations are based on preferences determined from the Bikeway Survey, are in response to direct input from the city departments and the public and are consistent with priority destination types determined popular in other comparable communities with constructed Bikeway facilities.

TOTAL SCHOOL BICYCLISTS PER DAY



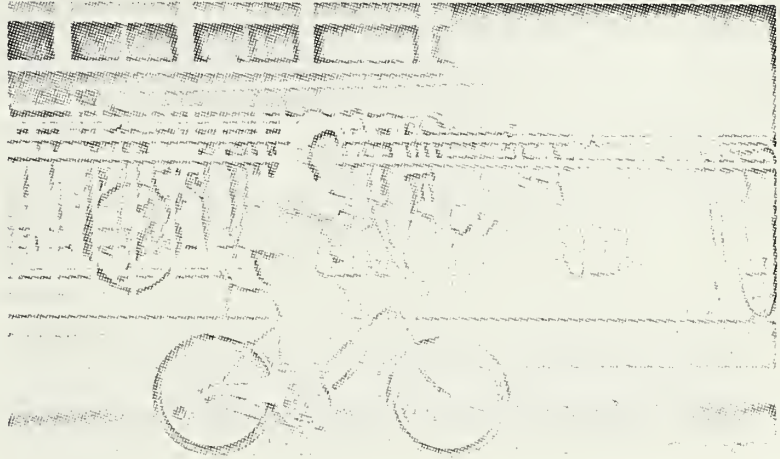
SAFETY

Essential to the success of a Bikeway facility is an alignment that provides safety for the bicyclist and motorist. A safe riding environment for the bicyclist stimulates usage and enhances the bicycling experience while providing for motorists' peace of mind.

Certain deductions can be made concerning bicycling traffic and vehicular traffic based on accident statistics:

1. High vehicular traffic volumes are assumed to be more dangerous for bicycle traffic than low volumes.

2. Greater posted speed limits for vehicular traffic reflect greater danger for bicycling traffic.
3. Larger numbers of intersections per mile are assumed to increase danger because approximately two-thirds of recorded bicycle accidents occur at intersections.



Based on these assumptions the following rationale for safe alignment of Bikeways within Billings should apply:

1. Where an easement or right-of-way independent of a street is available for desired use it will take priority for development.
2. Where a low volume but direct street is available for desired use it will take development priority over heavily traveled streets.
3. Where a street is determined to be dangerous for bicycling but has a high desired use, the street will be given consideration if design options for implementation of a safe alignment are available.

CONTINUITY

The overall usefulness of the Bikeway System will depend partially upon the internal continuity of the system within the Billings proper and external continuity to outlying areas. Access to immediate destinations that could be achieved with alignments that would also interconnect with other immediate destination alignments would increase the origin-destination opportunities and

stimulate more general bicycle circulation. A continuity to the alignments of Bikeways would benefit the utility aspects of bicycling and would provide additional recreational bicycling opportunities.

The most outlying population nodes within the Billings Urban Area are only four to five miles from the Central Business District. At an average speed of ten miles per hour on a Bikeway facility this would be a bicycle riding time of a half hour or less. The riding time on a Bikeway facility from one extreme to the other extreme of the Urban Area would probably be about an hour.

While bicycling from extreme to extreme might be a rare type of trip, it would be desirable to achieve the opportunity by aligning individual segments of the Bikeway so such movement would be possible.

The following rationale should apply to help achieve a continuity within the Bikeway System:

1. Alignments of desired use that interconnect with other alignments of desired use should be selected when possible.
2. Alignments of desired use that could eventually provide access to future areas of development should be selected when possible.
3. Alignments to interconnect two or more alignments of desired use or major segments of the Bikeway System should be considered but access and safety should take precedence.

DISCUSSION

Access, Safety, and Continuity are characteristics that will contribute or detract from the ultimate effectiveness of the Bikeway facility. Relative values of importance must be assigned to each when determining specific alignments.

Access and Safety should be the overriding determinants in selecting alignments. Continuity should be considered to help achieve a more desirable total system.

City Area Analysis

The previous section discussed where Bikeway facilities should generally go. This section discusses where Bikeway facilities can realistically go.

The City of Billings has a need for Bikeways, but the constraints as well as the opportunities for development of Bikeways within the physical make-up or personality of the city must be understood before alignments can be rationally selected.

THE PERSONALITY OF BILLINGS

Billings is a fairly well defined city bounded on three sides by natural features that have contained most of the major developments of the city within a contiguous and comprehensible area. The Rimrocks on the north and east and Yellowstone River on the south, however, have given way to development of the Billings Heights and Lockwood areas to the north and east and development to the west in recent years.

The general layout of the Billings area is on a north/south and east/west grid except for a portion of the original city area that was laid out on a grid pattern parallel to the Great Northern Railroad.

The grid system offers opportunities for the development of a Bikeway System because there are usually alternative alignments running parallel to one another that are available for Bikeway development consideration within a desired use area. The grid also allows for loop Bikeway alignments which are considered more viable than isolated Bikeway segments.

The relatively level terrain within the Billings area offers very little limitation except for access to the top of the Rimrocks on the north.

The climate in the Billings area is almost ideal for bicycling except for the colder months from November to February. The other eight months of the year are quite congenial to bicycling with even the warmer days during the summer offering little restriction. Wet weather will discourage some bicycling but is not considered a serious limitation.

PHYSICAL OPPORTUNITIES FOR BIKEWAY DEVELOPMENT

Some of the opportunities evident in the Billings area for Bikeway facility development are long range options that will require coordinated planning with other city facilities. Other opportunities, however, are available now and can be considered as options for initial development.

EASEMENTS

Two outstanding opportunities that exist for Bikeway development are the Arnold Drain easement and Billings Bench Water Association canal easement. Both easements have been discussed in earlier planning documents which recommended linear park development for both. Bikeways would be consistent with these proposals.



Arnold Drain west of Lillis Park



Arnold Drain opposite Burlington School

The Arnold Drain runs parallel on the north side of Broadwater Avenue west of Lillis Park through existing and future housing areas and terminates in agricultural lands just to the east of Shiloh Road. The Arnold Drain is buried from the east edge of Lillis Park and runs west to east through residential areas varying in width from 100 feet to 30 feet terminating as a usable easement at Alpine Village on 16th Street West.



BBWA Canal character



BBWA Canal east of Eastern Montana College

The BBWA easement, which is 100 feet wide on a north/south axis along 28th Street West and runs generally on a diagonal alignment from the western boundary of Lillis Park along the western edge of Rose Park, past Rocky Village, the Highlands Golf Club and through the campus of Eastern Montana College. To the east of EMC the BBWA canal easement parallels the Rimrocks and ends at North 15th Street as a tunnel under the rims. Almost the entire length of this easement is bounded by residential areas.

Both the Arnold Drain easement and BBWA canal easement provide for the opportunity to develop independent Bike Paths which would fulfill desired uses for access to parks and schools and other destinations along the easements from the adjoining residential areas.

The City-County Drain to the south of King Avenue in the vicinity of Ponderosa School also has the potential for development of an independent Bike Path. This development would improve bicycling access to Ponderosa School and could become an important alignment for access to the park facilities that will be developed on the Amend property at King Avenue and Billings Boulevard.

The Burlington Northern Railroad right-of-way east of the fairgrounds that the city and county are contemplating the purchase of would provide an opportunity for an independent Bikeway facility. Access from the fairgrounds through the Heights to Mary Avenue would be possible.

The BBWA canal easement again becomes a usable surface easement at Afflerbaugh Park in the Billings Heights and could be developed as far north as Lake Elmo. Discussion of these easements is from a potentiality standpoint. A number of technical and legal matters would have to be resolved before these easements could be developed as Bikeway facilities.

PARKS

The larger city parks, including South Park, North Park, Optimist Park, Pioneer Park, Rose Park, Central Park, Stewart Park, and the future development of Homestead Park, can accommodate Bikeway facilities internally for recreational riding. Many of these parks already have wide sidewalks that can serve for both pedestrians and bicyclists.



Roadway through Pioneer Park



Rose Park pedestrian and bicycle bridge

SCENIC AREAS

Within the Billings area there are scenic areas that are not easily accessible by bicycle currently but could become accessible and if so would be very desirable for recreational Bikeway facility development. The Yellowstone Riverfront Park area could include an outstanding recreational Bikeway from Billings Boulevard along the riverfront to Coulson Park in Billings Heights. Such a development would have to be phased with land acquisition and park development. The Rimrocks are another recreational Bikeway opportunity. Starting at Zimmerman Park



Character along the top of the rims

a Bikeway could run along the top of the Rimrocks to Swords Park. Some alignment within the right-of-way of Route 3 would be necessary where land is privately owned. Such an undertaking would have to be coordinated with park improvement programs along the Rimrocks.

RURAL AREAS

Billings bicyclists are fortunate to have the opportunity to ride in rural areas adjacent to the city limits where traffic flows are light and scenery diversified. Development of rural Bikeway facilities can be established with minimal development and improved as growth takes place in their vicinity.

EXISTING STREET SYSTEM

The Billings street network includes a number of streets that provide through bicycling opportunities but have light traffic counts. Some street



Wide shoulder along Poly Drive



Potential along 27th Street hill

rights-of-way and paved sections include enough space to easily accommodate adaptive or new Bikeway facilities. Wide boulevards with existing four foot to six foot sidewalks are excellent opportunities in some of the older sections of the city.

FUTURE PRIVATE DEVELOPMENT

As new residential areas are developed within Billings there will be an opportunity to provide internal Bikeway facilities similar to those proposed at Rocky Village. The private Bikeways can in turn be tied into the City Bikeway facility. Such an approach will encourage more independent Bike Paths and reduce the city's responsibility to build local or neighborhood facilities.

CITY IMPROVEMENT PROGRAMS

There will be opportunities to develop Bikeway facilities in conjunction with street improvement programs. Development of new park areas within Billings can include Bikeway facilities where appropriate. Public housing programs can also include Bikeway facilities as an integral part of their development.

PHYSICAL CONSTRAINTS FOR BIKEWAY DEVELOPMENT

Some of the problems associated with Bikeway facility development in the existing urbanized sections of Billings may seem formidable but are not necessarily insurmountable. Sufficient public support and sufficient funding will allow for physical solutions to almost any design difficulty. However, there are constraints that must be recognized and respected and avoided where realistic alternatives are available.

TRAFFIC VOLUMES

The most overriding constraint for the development of Bikeway facilities seems to be streets with heavy vehicular usage and associated high travel speeds. The Principal and Minor Arterials are not, in most cases, realistic alignment opportunities for Bikeway facility development due to the unsafe character of these streets for bicycle traffic, the lack of space or opportunity to provide Bikeway facilities and the unhealthy amount of exhaust fumes along these alignments.

Collector streets are far from ideal, again, due to the conflict between heavy vehicular traffic and bicycle traffic. Collectors, however, are

in many cases more adaptable for Bikeway facilities because of available right-of-way space. The Arterial and Collector system within Billings provides direct access alignments that in some cases cannot physically be paralleled with alternate routes for desired bicycling access.

The only way this situation can be overcome is to align the most realistic Bikeway facility option within the street right-of-way or acquire additional right-of-way solely for the Bikeway facility development.

INTERSECTIONS

Intersections are the most dangerous points along a Bikeway alignment and relative values of danger are in direct relation to the size of traffic flows.

Signalized intersections reduce the danger quotient but are not always located to accommodate desired use alignments for Bikeway facilities.

PARKING

Parking along streets constricts the total usable space for vehicular and bicycle movement and in many cases if retained, eliminates the opportunity for Bikeway facilities on the existing paved street section. The abutting owners have no vested right to on-street parking and the city can limit or eliminate parking in order to expedite the movement of traffic including bicycles.

Street-side parking is not a commodity to be given up easily by most homeowners, however.

The elimination of all or partial street-side parking for a Bikeway facility that may not be used continuously is usually a touchy issue. This situation is magnified when commercial parking spaces are jeopardized.

STREET CONDITIONS

A serious constraint to the development of Bikeway facilities on existing street sections is the deteriorated condition of many streets within the Billings area. Rough or crumbling pavement is very difficult and dangerous to negotiate with a bicycle. While this constraint can be easily overcome with street improvements, initial Bikeway development should avoid deteriorating alignments.

COMPOSITE ANALYSIS SUMMARY

The Composite Analysis Summary illustration organizes and condenses much of the data used to determine the Bikeway facility alignments. General points of destination, and major constraints are specifically delineated with some specific opportunities also indicated where graphically feasible. The actual evaluation work was performed on city maps that included much more detail and information. This illustration was prepared primarily for the reader's ease of reference.

Three key sources used to assemble the analysis information were the Billings Montana Urban Transportation Plan, the Comprehensive Plan for the Billings Planning Area, and the Billings Park, Recreation and Open Space Study for the Billings, Montana Urban Area.

The existing and proposed arterial and collector system is shown. The Central Business District and general commercial areas are delineated. The schools, parks, and open space areas are plotted according to particular designations such as City Park (a major desired use area and destination for bicycling), Neighborhood Parks (less important but desirable bicycling destinations). Other major bicycling destinations such as the Metra Center are also shown.

Land use configurations were analyzed and non-compatible use areas for bicycling such as industrial sections eliminated for serious consideration. Due consideration was given primarily to residential areas that are recognized as the points of origin for the majority of bicycling traffic.

Lake Elmo

MARY STREET

BARRETT RD

WICKS LANE

LAYE ELMO DRIVE

HIGHWAY 10

BENCH BOULEVARD

NAVIGATOR LANE

BITTENROOT DRIVE

HILLTOP ROAD

YELLOWSTONE RIVER ROAD

Coulson Public Park

Swords Park

Metra Center Fair Grounds

Two Moon Park

Central Business District

Josephine Park

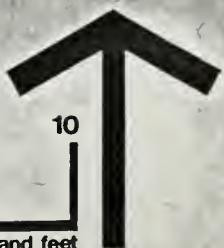
Big Sky Park

RIVER

YELLOWSTONE

0 1 2 3 5 10

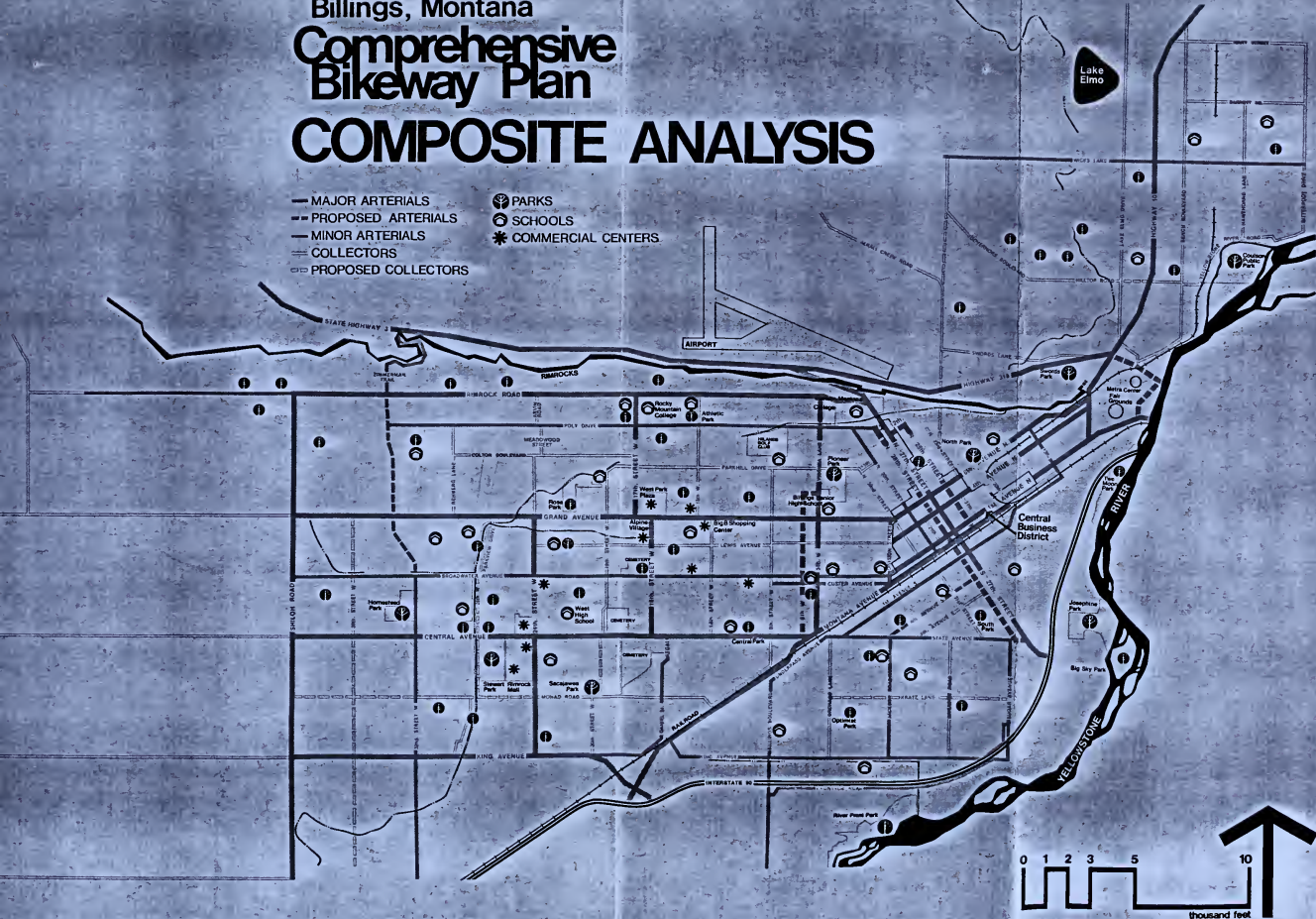
thousand feet



Billings, Montana Comprehensive Bikeway Plan

COMPOSITE ANALYSIS

- MAJOR ARTERIALS
- - - PROPOSED ARTERIALS
- MINOR ARTERIALS
- COLLECTORS
- - - PROPOSED COLLECTORS
- ⊙ PARKS
- ⊙ SCHOOLS
- * COMMERCIAL CENTERS



Corridor Network

The implementation of the Bikeway System will be a long term process. Citizen support and continued funding availability will be necessary catalysts to achieve phased implementation that will require years to complete.

To achieve a comprehensive Bikeway plan that can accommodate changes taking place within the Billings area during the implementation period a certain degree of flexibility within the system is desirable. "Corridor" type Bikeway alignments were considered as a realistic approach.

BIKEWAY CORRIDOR

"A Bikeway Corridor is an alignment of intent for the development of a Bikeway facility. Such a corridor usually includes a cross section area three city blocks wide."

The corridor approach to Bikeway alignment is also desirable from a number of other aspects. It allows the public in a corridor area to react favorably or otherwise to the proposed alignment. It allows for specific demand data to be assembled prior to final alignment determinations and allows for design solution alternatives based on the opportunities within the corridor to be evaluated when detailed alignment engineering is accomplished.

CORRIDOR DETERMINATIONS

When determining the Bikeway Corridor alignment decisions, the analysis information was weighted according to the previously defined general alignment objectives of Access, Safety, and Continuity. Compatibility of the Bikeway alignments with the Urban Transportation Plan, Com-

prehensive Plan, and Park and Recreation Plan were also major considerations in the selection of Bikeway Corridor Alignments.

By process of elimination of many of the major constraints such as heavy traffic streets, avoidance of short segment streets, and streets with limited bicycle use potential, the opportunities for viable Bikeway alignment options were substantially reduced.

Potential use alignments became quite clear when major constraint alignments were eliminated from consideration.

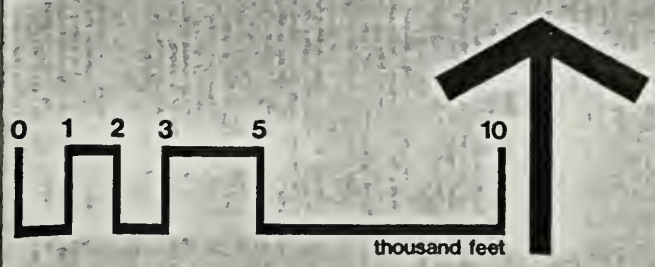
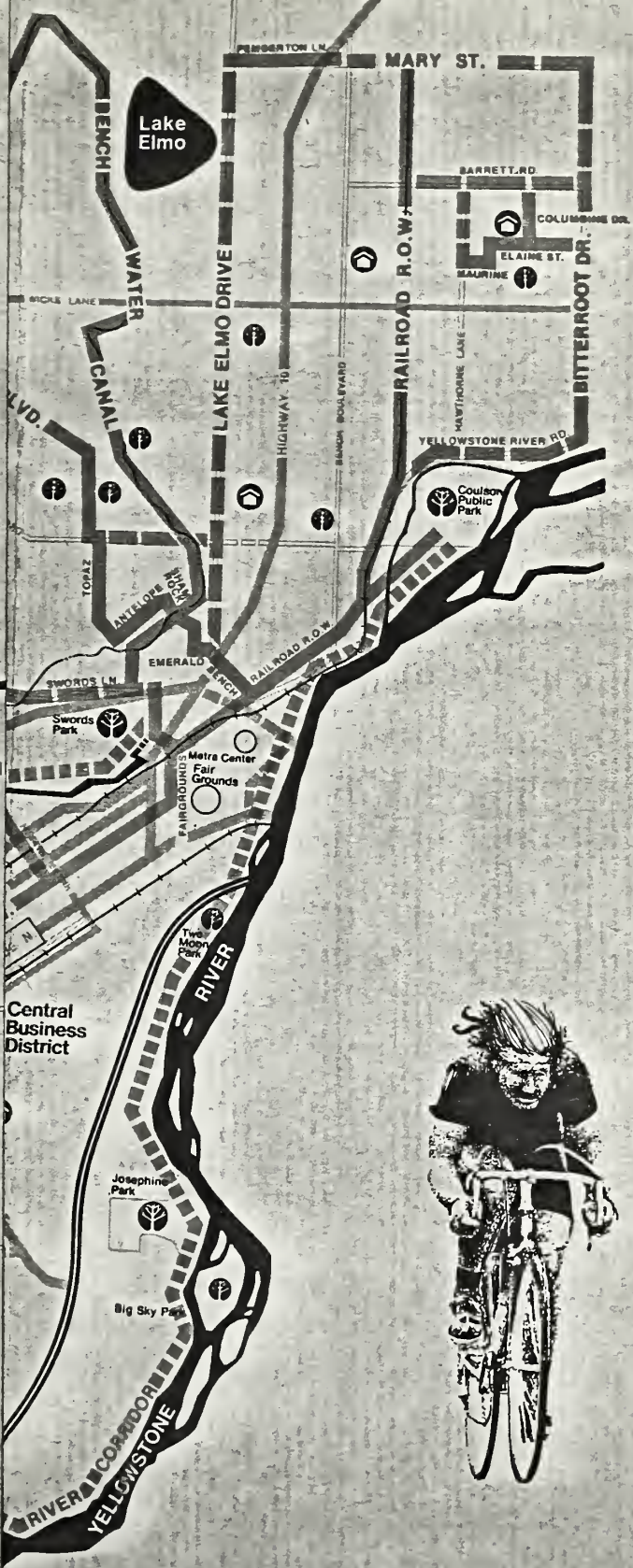
Through street and easement alignments considered most desirable from access and safety standpoints were plotted first. Alignments providing access to secondary use areas and alignments deemed necessary to achieve continuity within the total network were then plotted.

Where more than one opportunity for alignment was available, trade-offs were evaluated and the specific alignment with most merit chosen. The majority of the Bikeways initially plotted avoided serious development constraint characteristics while providing access to desired areas. However, gaps in the total network were evident.

Destinations or desired use areas accessible only via the arterial and collector system and linkages needed to achieve continuity were plotted with constraints clearly in mind. Constraint alignments with lesser degrees of difficulty and design opportunities which would allow realistic Bikeway facility development were sought. In no case was an alignment with serious constraint characteristics chosen unless viable design opportunities for Bikeway facility development were available.

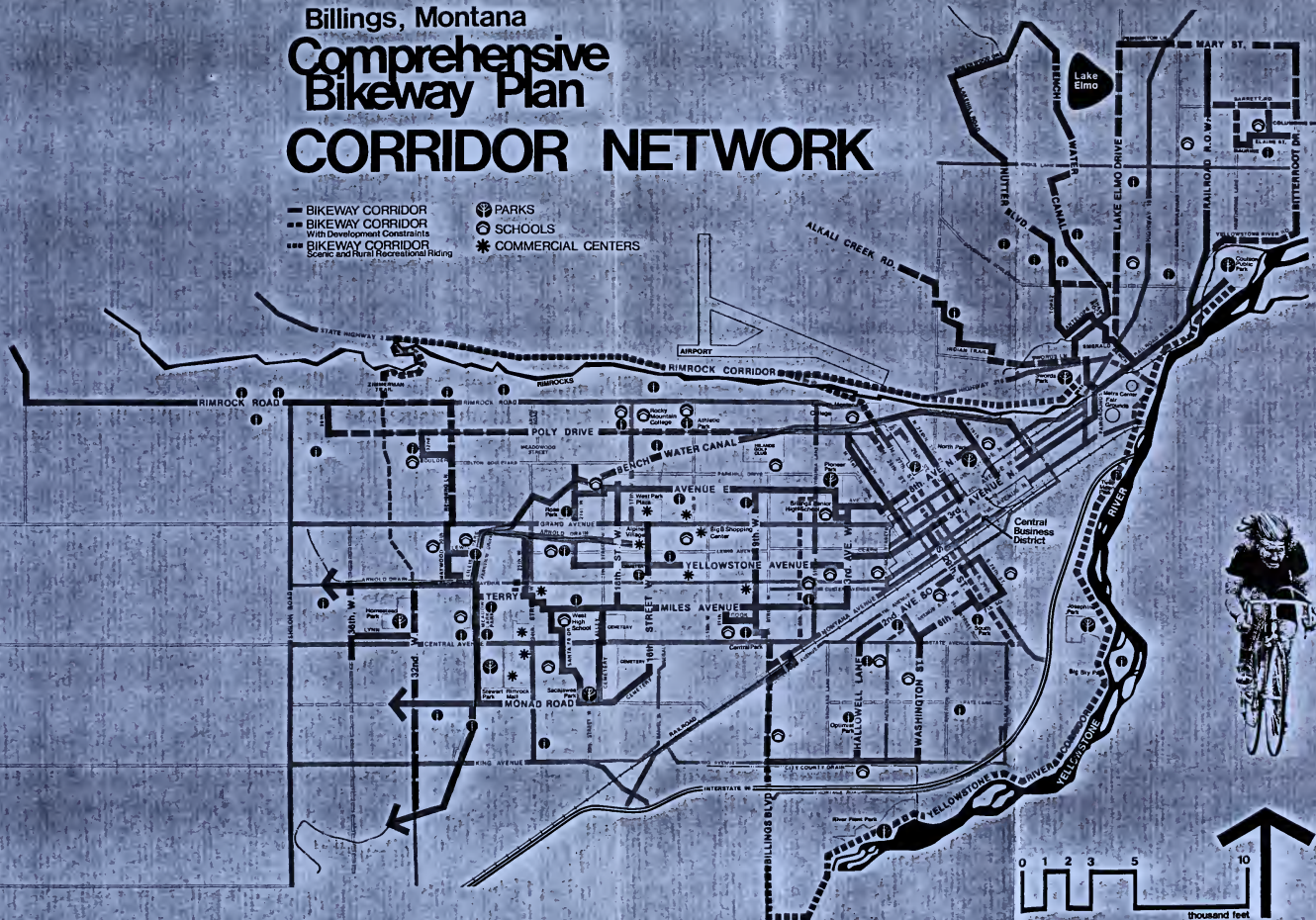
NETWORK PLAN

The Network Plan delineates an integrated system of recreational and utility or commuting Bikeway Corridors. The corridor delineation infers the three block width, but for graphic clarity is shown narrower. The alignments indicated are along the preferred routes within the corridors although other development options and opportu-



Billings, Montana Comprehensive Bikeway Plan CORRIDOR NETWORK

- BIKEWAY CORRIDOR
- BIKEWAY CORRIDOR
With Development Constraints
- BIKEWAY CORRIDOR
Scenic and Rural Recreational Riding
- PARKS
- SCHOOLS
- COMMERCIAL CENTERS



ities would be considered during the detailed design and engineering phase prior to implementation.

Corridor alignments with serious physical constraint characteristics are specially delineated to call attention to their locations. Most of these corridors are key linkages within the total network but will require special design consideration.

The Corridor Network represents the ultimate development of the Billings Bikeway System for the existing city area. As the city expands and changes, realignments and new alignments for Bikeways will be necessary.

CORRIDOR PRIORITIES

Essential to the logical development of the Bikeway facilities is the establishment of priorities for implementation of various segments. Priorities for development should be based on need and suitability characteristics. Immediate need priorities within the Billings area can be interpreted based on the survey responses, observed usages and logical anticipation of latent demands.

The major demands evident citywide are for access to city parks and schools, and for recreational riding in proximity to neighborhood origin areas. Based on these demands, the corridor alternatives that should be developed initially are those leading to the major city parks while providing access to local schools and providing recreational opportunities.

These priority designations when applied to the Corridor Network suggest a number of opportunities. One particularly strong linkage of corridors is especially evident running between North Park in the northeast section of the city and Stewart Park on the western edge of the city. Pioneer Park, Rose Park, Burlington Park, Lillis Park, Millice Park and Meadowlark Park are located along this corridor alignment.

Such a linkage would provide access from adjoining residential areas to schools along the entire alignment including Meadowlark School, indirect access to Will James Junior High, Burlington

School, Rose Park School, Senior High, McKinley School, and North Park School. This alignment would also provide major east/west segments for commuting or recreational riding.

Other opportunities are also evident. Corridors in the vicinity of South Park and Optimist Park provide immediate access to the parks and adjacent schools. The City/County Drain Corridor along King Avenue could provide access to Ponderosa School from both east and west directions.

Initial Development Priorities:

1. A Bikeway facility should be considered that would link the Major City Parks, Schools, and Neighborhood Parks together through a central axis generally running from Stewart Park to North Park.
2. A Bikeway facility should be considered that would link South Park, Highland Park, and Taft School.
3. A Bikeway facility should be considered that would link Optimist Park and Ponderosa School and that would provide more direct and safer access to Ponderosa School. Priorities two and three could also be linked together to create a contiguous system throughout the southern section of Billings.

The city should thoroughly review priority alignments with the adjoining neighborhoods prior to detailed design and implementation. This review process will no doubt stimulate input that may contribute substantially to the final alignment of these selected corridors.

Development of these priority Bikeways would disperse facilities into different sections of the city. Such a dispersion would not only be an equitable organization of facilities but would be desirable so that sectional responses to the Bikeways could be monitored and usages evaluated before further definition of priorities.

Segments of the total network that are not necessarily within priority project areas, but that can be accomplished with street improvement projects or other city projects, should be expedited. Such a policy could save substantial cost and would help to assure realistic construction sequences.

General Recommendations

- 1 The City of Billings should establish a policy for the development of Bikeway facilities and should promote bicycle usage within the city.
- 2 The City of Billings should delegate a department or interdepartmental agency to act as liaison between the city and the county and the general public concerning Bikeway matters. This authority should also seek funding monies, coordinate implementation and maintain the Bikeways.
- 3 The City of Billings should establish a Demonstration Bikeway Facility - along a priority corridor - as the first phase of implementation. This facility would show the community what a Bikeway is and could be monitored to determine community acceptance.
- 4 The City of Billings should include the Bikeway Plan as an element within the overall Transportation Plan which would insure regular review and updating as needed.

Along with the development of a Bikeway facility other requirements are essential to assure proper function of the system:

- 5 The City of Billings should revise or provide new codes and ordinances where necessary to accommodate the implementation and administration of the Bikeways.
- 6 The City of Billings should make provisions for coordinated bicycling safety and educational programs that would serve as a prerequisite to driver education. Bicycle training and training facilities should be included with the safety and educational programs.
- 7 The City of Billings should develop and enforce a bicycle registration program that would aid in theft control and produce revenues for the Bikeways.

Demonstration Bikeway

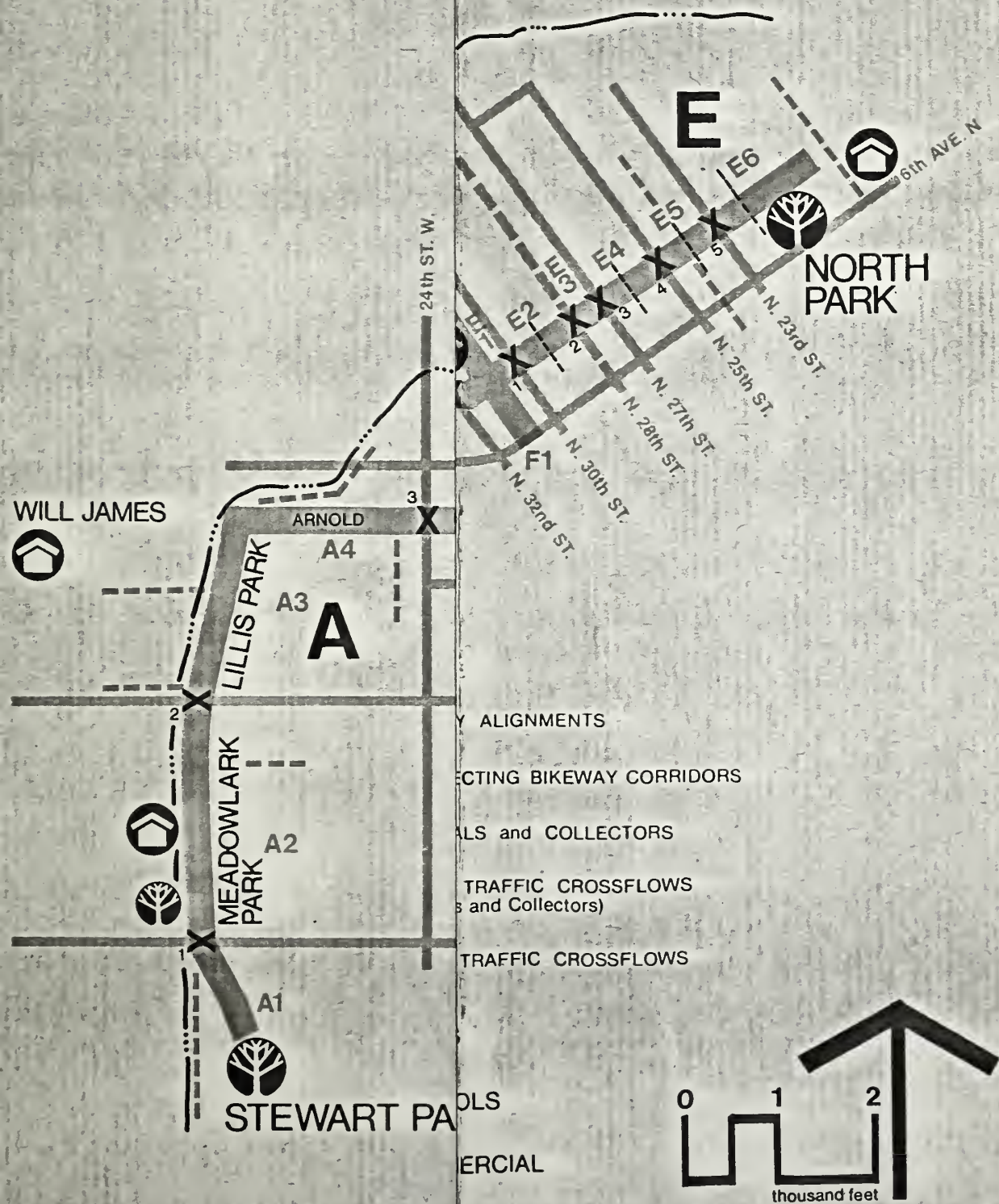
Development of a Demonstration Bikeway facility would provide the opportunity to test the applicability of certain design standards within Billings from an Access, Safety, and Continuity standpoint and would provide real construction cost information. Monitoring of such a facility could also help to provide substantial base data that would be essential as a point of reference for further Bikeway facility alignment decisions, priority definitions, and detailed design decisions.

In essence, a Demonstration Bikeway would give the city, bicyclists, and the general public within Billings a facility to meaningfully use and react to.

DESIGN CRITERIA

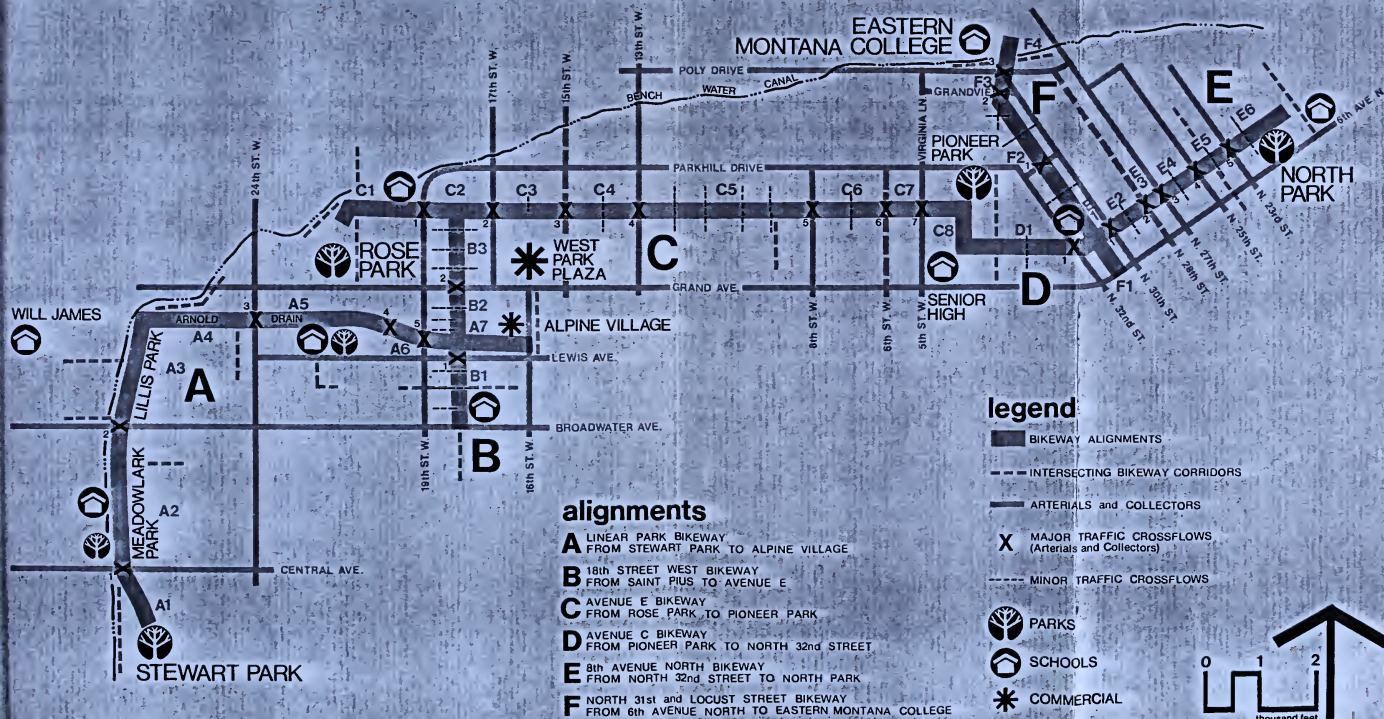
Certain design criteria should be considered for a Demonstration Bikeway:

1. The Demonstration Bikeway should provide for both recreational bicycling and utility of commuting bicycling.
2. Generally speaking, the Demonstration Bikeway should be in excess of five miles in length to assure continued interest and utilization.
3. The Demonstration Bikeway should provide access from known areas of origination to major termini.
4. The Demonstration Bikeway should include the development of various recognized design standards.
5. The Demonstration Bikeway should be developed in areas of known bicycling usage and assumed latent demand.
6. The Demonstration Bikeway should be developed in areas where public acceptance can be realistically assured.



Billings, Montana Comprehensive Bikeway Plan

DEMONSTRATION BIKEWAY



LOCATION RATIONALE

It is felt that the Priority Corridor between Stewart Park and North Park affords the greatest opportunity for a Demonstration Bikeway within Billings. The City Parks, schools, and adjacent shopping centers would act as points of destination from both directions along the alignment. The east/west aspect would provide the opportunity for commuter bicycling toward the Central Business District and Eastern Montana College.

The Priority Corridor is over five miles in length and includes segments that would allow the development of a cross section of Bikeway design standards.

The entire length of this Priority Corridor is bounded on both sides by single family and multi-family housing. Bicycle usage within the corridor alignment has been observed as the heaviest general area of usage within the city. This usage can be attributed to the major destinations within the area and proportionately high bicycle ownership characteristics within the area.

ALIGNMENT DISCUSSION

The Demonstration Bikeway alignment from Stewart Park to North Park includes six major alignments which can be defined as:

ALIGNMENT A

Linear Park Bikeway from Stewart Park to Alpine Village

ALIGNMENT B

18th Street Bikeway from Saint Pius School to Avenue E

ALIGNMENT C

Avenue E Bikeway from Rose Park to Pioneer Park

ALIGNMENT D

Avenue C Bikeway from Pioneer Park to North 32nd Street

ALIGNMENT E

8th Avenue North Bikeway from North 32nd Street to North Park

ALIGNMENT F

North 31st and Locust Street Bikeway from 6th Avenue North to Eastern Montana College

Beginning with Stewart Park, which is a partially developed Baseball and Tennis Complex, there is a proposed Park Bikeway alignment that will interconnect all park facilities.



STEWART PARK AREA

developed park facilities in the background

Bearing north from Stewart Park the Demonstration alignment crosses Central Avenue into Meadowlark Park, which is an undeveloped linear park. Millice Park and Meadowlark School are immediately adjacent to this segment on the west side of the BBWA Canal. Existing access to Meadowlark School over the Canal is provided by a pedestrian-bike bridge.



MEADOWLARK PARK • undeveloped linear park

Directly north of Meadowlark Park across Broadwater Avenue lies Lillis Park. Lillis Park is a well developed neighborhood park that includes a Bikeway the full length of the park. Access to the western edge of the BBWA Canal across a bike-pedestrian bridge toward Will James Junior High School is provided from Lillis Park.



LILLIS PARK
with internal pedestrian and Bike Paths

Lillis Park bounds the Arnold Drain easement on the north. The Arnold Drain easement is a covered city storm drain from Lillis Park to Alpine Village Shopping Center at 16th Street West. This easement is currently undeveloped and varies from 60 feet to 30 feet in width. There is an excellent opportunity to develop Arnold Drain as a linear park with inclusion of a Bikeway. Major traffic crossings exist at 24th Street West and 19th Street West.



ARNOLD DRAIN EASEMENT
looking toward 24th Street West



ARNOLD DRAIN EASEMENT
next to Burlington Park and School

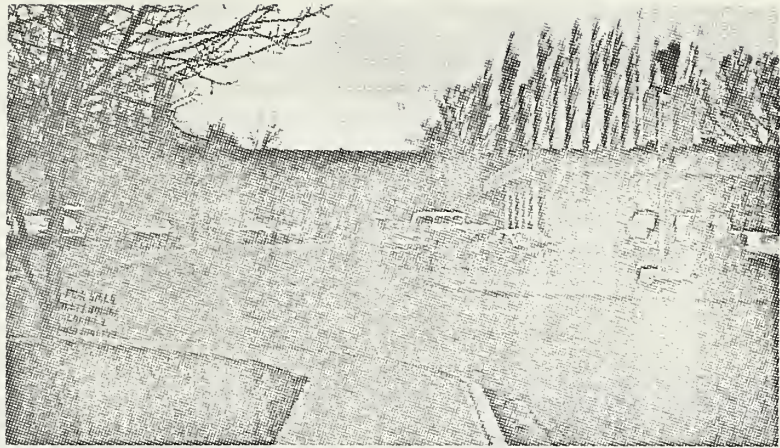


ARNOLD DRAIN EASEMENT
Alpine Village in the background

A Bikeway alignment along 18th Street West would connect the linear park alignment and Saint Pius School with the Avenue E alignment. Major traffic crossings would be encountered at Lewis Avenue and Grand Avenue.



18th STREET WEST
looking north from Saint Pius School



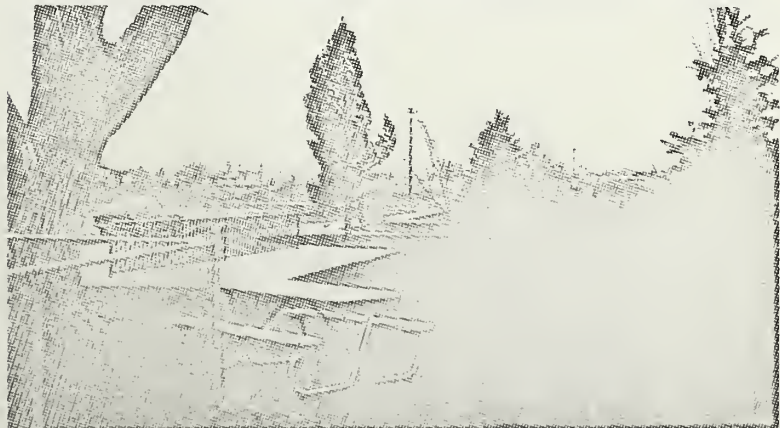
18th STREET WEST • major crossing at Grand Avenue



18th STREET WEST • looking toward Avenue E

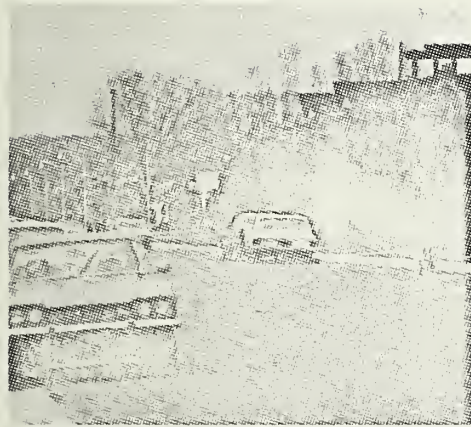
The Avenue E Bikeway would terminate at Rose Park and Rose Park School on the west and Pioneer Park on the east.

Rose Park is a developed City Park that has an internal Bikeway-Pedestrian system that could



ROSE PARK • looking west from Rose Park School

be tied into from Avenue E. Pioneer Park is a well developed City Park that includes plans for Bikeway facilities. Currently, there is an access road along the southern edge of the park next to Senior High School that could serve as a Bikeway. Major traffic crossings along the Avenue E Bikeway include 19th Street West, 17th Street West, 15th Street West, 13th Street West, 8th Street West, 6th Street West, and Virginia Lane.



AVENUE E • looking west
toward 17th Street West



AVENUE E
Pioneer Park in the background



PIONEER PARK
park access road



PIONEER PARK
pedestrian and Bike Path

The Avenue C Bikeway and 8th Avenue North Bikeway connect Pioneer Park and North Park while providing access to McKinley School and North Park School. Some roadways within North Park could be used as Bikeways or new Bikeways could be developed. Major traffic crossings along this alignment include North 32nd Street, North 30th Street, North 28th Street, North 27th Street, and North 23rd Street.



AVENUE C • looking toward Pioneer Park



8th AVENUE NORTH • looking west from North 25th St.

The North 31st and Locust Street Bikeway provides access from 6th Avenue North to the Avenue C and 8th Avenue North alignment and to Eastern Montana College. Wide sidewalks at EMC provide internal bicycling circulation. The major traffic crossings along this alignment include 11th Avenue North, Grandview Boulevard, and Poly Drive.



NORTH 31st STREET • wide
boulevards and sidewalks



NORTH 31st STREET
looking toward McKinley School

ALIGNMENT ANALYSIS

(See Appendix B)

The six major alignments within the Demonstration Bikeway were broken down into alignment segments to further evaluate specific characteristics that would aid in determining Bikeway development options. Vehicular crossflows were identified and Average Daily Traffic counts and accident rates listed for Collector and Arterial street crossings. These relative values were helpful in determining options for safe intersection design. Options to be considered include:

1. Crosswalks and Cautionary Signing
2. Signalization
3. Grade Separated Crossings

These options would be developed in sequence of the listing based on demonstrated demand for such facilities.

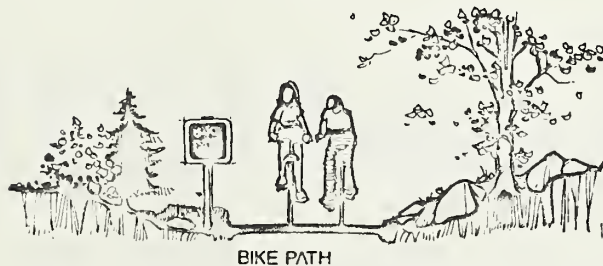
The physical configuration of each segment was evaluated. Characteristics of streets, sidewalks, and boulevards were analyzed. Demonstration Bikeway development options per segment were determined based on a process of elimination of those options that were realistic and consideration of those that had merit. For example, a street with a 60 foot right-of-way that included used parking lanes and confined traffic lanes were not considered for Bike Lane development while Bike Lanes were considered on streets with wider rights-of-way that had wide traffic lanes that could accommodate both vehicles and bicycles. Development options were sought along the Demonstration Bikeway that would not require removal of parked cars. Options that would allow for consistent facility design along major alignments were considered rather than fragmented application of design standards per segment.

ALIGNMENT DEVELOPMENT RECOMMENDATIONS

To assure that various Bikeway design standards would be used within the Demonstration Bikeway, as previously suggested, the individual segment options as well as the total system was thoroughly analyzed. The following recommendations for the various alignments within the total Demonstration Bikeway are considered to be the most advantageous for the total system.

ALIGNMENT A

It is recommended that the LINEAR PARK BIKEWAY FROM STEWART PARK TO ALPINE VILLAGE be developed as a Bike Path (Class I, Type A).

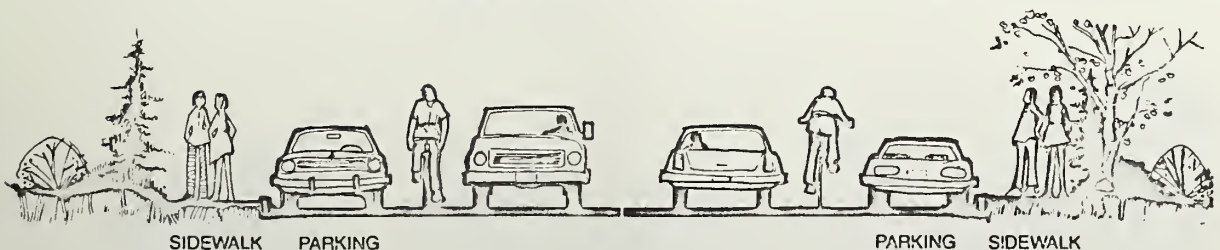


BIKE PATH

BIKE PATH-INDEPENDENT

ALIGNMENT B

It is recommended that the 18TH STREET BIKEWAY FROM SAINT PIUS SCHOOL TO AVENUE E be developed as a Bike Route (Class III, Type A).



SIDEWALK

PARKING

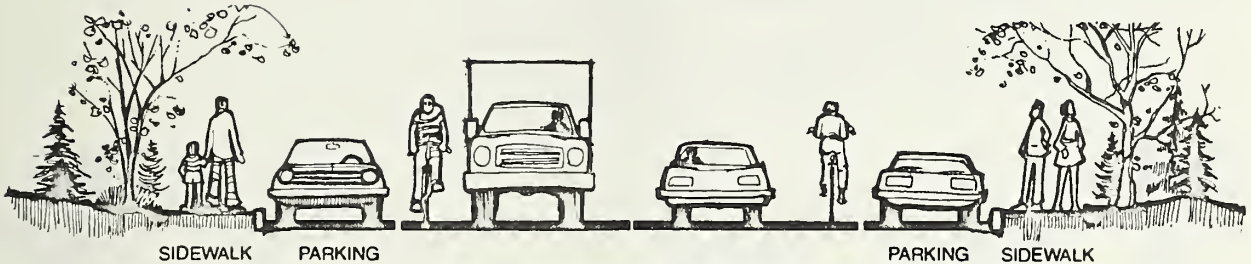
PARKING

SIDEWALK

BIKE ROUTE BICYCLIST COMPETES WITH VEHICLES

ALIGNMENT C

It is recommended that the AVENUE E BIKEWAY FROM ROSE PARK TO PIONEER PARK be developed as a Bike Route (Class III, Type B), and Bike Paths (Class I, Type A) be developed in the parks.



BIKE ROUTE · VEHICLES YIELD TO BICYCLIST

ALIGNMENT D

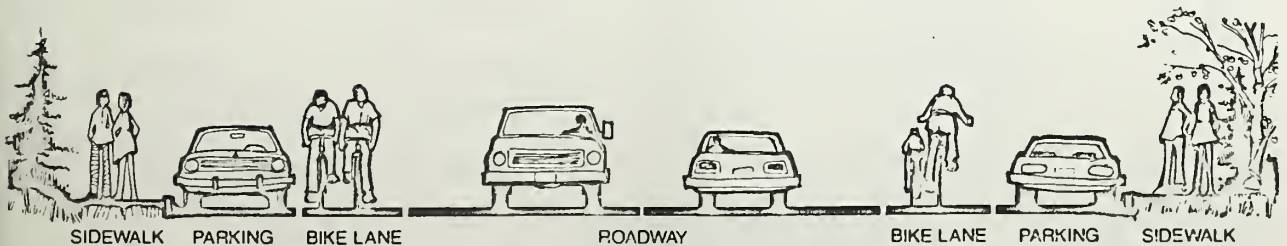
It is recommended that the AVENUE C BIKEWAY FROM PIONEER PARK TO NORTH 32ND STREET be developed as a Bike Route (Class III, Type C).



BIKE ROUTE · DEDICATED FOR BICYCLING
[limited vehicle access]

ALIGNMENT E

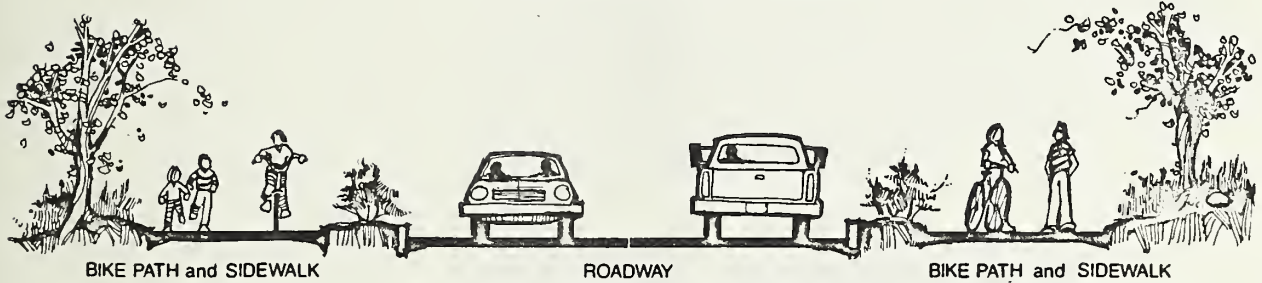
It is recommended that the 8TH AVENUE NORTH BIKEWAY FROM NORTH 32ND STREET TO NORTH PARK be developed as a Bike Lane (Class II, Type C) and Bike Paths (Class I, Type A) be developed in South Park.



BIKE LANE · LANE OUTSIDE OF PARKING

ALIGNMENT F

It is recommended that the NORTH 31ST AND LOCUST STREET BIKEWAY FROM 6TH AVENUE NORTH TO EASTERN MONTANA COLLEGE be developed as a Bike Path (Class I, Type C) and Bike Paths (Class I, Type A) be developed at EMC.



BIKE PATH · SHARED WITH PEDESTRIANS

These recommendations should serve only as a guideline and require confirmation by adjoining neighborhood areas when public hearings are held to discuss the Demonstration Bikeway prior to implementation. Area for reasonable adjustment and compromise is certainly feasible and should be accommodated if desired by immediate homeowners.

COST ANALYSIS

Based on the cost figures spelled out in a previous section the following ball park figures help to establish the implementation costs for the Demonstration Bikeway.

Linear Park Bikeway	(Alignment A)	2.00 miles @ \$45,000/mi.	\$ 90,000.00*
18th St. Bikeway	(Alignment B)	.68 mile @ \$ 7,000/mi.	4,760.00
Ave. E Bikeway	(Alignment C)	.56 mile @ \$45,000/mi.	25,200.00
		1.70 miles @ \$ 7,000/mi.	11,900.00
Ave. C Bikeway	(Alignment D)	.25 mile @ \$ 5,000/mi.	1,250.00
8th Ave. No. Bikeway	(Alignment E)	.90 mile @ \$ 7,000/mi.	6,300.00
North 31st & Locust St. Bikeway	(Alignment F)	.90 mile @ \$30,000/mi.	<u>27,000.00</u>
TOTAL ESTIMATED COST			\$166,410.00

*Cost for Bikeway only, does not include park development costs.

Funding Opportunities

Successful implementation of Bikeways for the City of Billings depends in large measure upon the availability of funds from either a single or from various sources to build portions of the Bikeway network and properly maintain the Bikeways. The following paragraphs explain briefly some of the sources and critical measures pertaining to Bikeway funding.

FEDERAL PARTICIPATION

1. Under the Federal Aid to Highways, Department of Transportation program, bicycle and pedestrian facilities may be constructed as incidental features of highway construction projects or independent projects. The total amount of funds obligated within the state for projects independent of street projects may not exceed two million dollars during a fiscal year.

The use of such funds for Bikeway development is in competition with monies that could be spent for highway projects. Priorities for highway development or Bikeway development or both will have to be made by the local governmental decision makers. Matching requirements for this program are one-third state, two-thirds federal.

Application procedure for funds to be used for Bikeways is accomplished in the same manner as for highway funds.

2. Department of the Interior, Bureau of Outdoor Recreation has funds available for establishing Bikeways as recreational facilities. The Bikeway facility must conform with the State Comprehensive Outdoor Recreation Plan.

While the 50/50 matching funds available through BOR could be sought for Bikeways,

there would be a conflict with the need for continued funding of the city parks projects. Only a limited amount of BOR funds are available each year for the parks and these limited funds cannot realistically be used for Bikeway development if the parks program is to continue on a scale similar to recent years.

3. The recently enacted Community Development Act of 1974 contains some promise of providing funds for Bikeways and associated facilities in a downtown area as part of an overall project. General transportation priorities might be formulated during the applications process with specific projects accomplished during implementation.
4. The new Urban Transit Bill, currently being considered in Washington, contains some funding provisions for Bikeways. Potential of relatively short term application is remote at this point.

LOCAL PARTICIPATION

1. Revenue sharing is a potential for funding portions of the Bikeway. Application for revenue sharing funds must be presented to the Commission on Community Affairs, who would decide on the priority of such a system.
2. Bicycle licensing fees are currently a minor source of funds for Bikeway development. Some revenue could be generated if strict licensing regulations were developed and enforced although such revenue would most realistically be assigned to administrative and maintenance costs for Bikeway facilities.
3. City Budget funds could be made available for Bikeway development if a high priority for Bikeways was established by the City Council.
4. Private funds are a potential source of monies for Bikeway development but would be limited. Contributions or possibly a foundation type grant could, however, be matched with other funds.

Conclusion

Billings, unlike some cities, has inherent physical characteristics that provide an outstanding opportunity to develop a Bikeway System. Implementation of the Billings Bikeways will require a sincere commitment by the people and the City Government.

The Billings Bikeways will be a valuable asset for the community. While the City Parks are an amenity of the city and the streets a functional necessity, the Bikeways will provide a facility with characteristics of both.

Not only will the Bikeways encourage utility bicycling and subsequently less of a dependence on the automobile, but they will also enhance the revitalization of a healthful and stimulating form of recreation. The Bikeways are essential if a compatible and equitable relationship between vehicular traffic and bicycle traffic is to be achieved within the city.

The Bikeways should not be viewed as an independent facility for a special interest group, but must be considered as an integral transportation and recreation component of the city that will benefit the general public. Such a perspective will allow for a proper assignment of priority for the Bikeways within the total priority needs for Billings.

Appendices

55

APPENDIX A

56-61

APPENDIX B

Billings Bikeway Survey

The City of Billings is conducting this survey to determine the need for and location of bikeways in the Billings area. Ultimately, once properly located and marked, the bikeways will be used for travel to and from schools, work, shopping, and for recreation. As someone who already may ride a bicycle, your input will be helpful to us in designing and locating the paths so that your needs will be effectively met.

We would appreciate your taking a few minutes to answer the indicated questions, and return or mail the questionnaire to: THE BILLINGS GAZETTE, Box: BIKE

1
2
3

DO YOU FEEL THAT THERE IS A NEED FOR BIKEWAYS IN BILLINGS? YES ☐ NO ☐

HOW MANY PERSONS ARE THERE IN YOUR HOUSEHOLD?

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐

HOW MANY RIDE BICYCLES?

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐

Please answer the following questions ONLY for those members of your household who ride bicycles.

4

PLEASE CHECK THE APPROPRIATE BOX FOR EACH BICYCLIST IN THE HOUSEHOLD.

BIKECLISTS IN YOUR FAMILY

AGE	NO. 1	NO. 2	NO. 3	NO. 4	NO. 5	NO. 6	NO. 7
UNDER 12	☐	☐	☐	☐	☐	☐	☐
12 - 17	☐	☐	☐	☐	☐	☐	☐
18 - 24	☐	☐	☐	☐	☐	☐	☐
25 - 44	☐	☐	☐	☐	☐	☐	☐
45 OR OLDER	☐	☐	☐	☐	☐	☐	☐
SEX							
MALE	☐	☐	☐	☐	☐	☐	☐
FEMALE	☐	☐	☐	☐	☐	☐	☐

5

AT PRESENT DO ANY MEMBERS OF YOUR HOUSEHOLD USE BIKES FOR THE FOLLOWING PURPOSES?

DESTINATION	YES	NO	ONCE A MONTH	ONCE A WEEK	MORE THAN ONCE A WEEK
WORK	☐	☐	☐	☐	☐
RECREATION	☐	☐	☐	☐	☐
SHOPPING CENTERS	☐	☐	☐	☐	☐
CITY PARKS	☐	☐	☐	☐	☐
COLLEGE	☐	☐	☐	☐	☐
ELEMENTARY SCHOOL	☐	☐	☐	☐	☐
JUNIOR HIGH SCHOOL	☐	☐	☐	☐	☐
HIGH SCHOOL	☐	☐	☐	☐	☐
PUBLIC TRANSIT STOP	☐	☐	☐	☐	☐
DOWNTOWN	☐	☐	☐	☐	☐
WEST OF SHILOH ROAD	☐	☐	☐	☐	☐
YELLOWSTONE RIVER	☐	☐	☐	☐	☐
AIRPORT OR TOP OF RIMS	☐	☐	☐	☐	☐

6

IF THERE WERE ADEQUATE BIKEWAYS PROVIDED, WOULD MEMBERS OF YOUR HOUSEHOLD USE THEM FOR THE FOLLOWING PURPOSES AND DESTINATIONS?

DESTINATION	YES	NO	DESTINATION	YES	NO
WORK	☐	☐	SENIOR HIGH SCHOOLS	☐	☐
RECREATION	☐	☐	PUBLIC TRANSIT STOP	☐	☐
SHOPPING CENTERS	☐	☐	DOWNTOWN	☐	☐
CITY PARKS	☐	☐	WEST OF SHILOH ROAD	☐	☐
COLLEGES	☐	☐	YELLOWSTONE RIVER	☐	☐
ELEMENTARY SCHOOLS	☐	☐	AIRPORT OR TOP OF RIMS	☐	☐
JUNIOR HIGH SCHOOLS	☐	☐			

7

IF THERE ARE ANY AMENITIES OR FEATURES WHICH MIGHT BE PROVIDED ALONG OR WITH BICYCLE PATHS, PLEASE SUGGEST THEM IN THE SPACE BELOW:

8

PLEASE LIST ANY COMMENTS OR SUGGESTIONS REGARDING THE BIKEWAYS:



A VILLAGE

BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
	Bike Path Type A
	Crosswalk Cautionary signing Signalization Overpass
	Bike Path Type A
	Crosswalk Cautionary signing Signalization Overpass
	Bike Path Type A
	Bike Path Type A
	Crosswalk Cautionary signing Signalization Overpass
	Bike Path Type A
No sidewalks No boulevard	Diagonal crosswalk Cautionary signing
	Bike Path Type A
	Crosswalk Cautionary signing
	Bike Path Type A

ALIGNMENT A LINEAR PARK BIKEWAY FROM STEWART PARK TO ALPINE VILLAGE

MAP CODE	ALIGNMENT SEGMENT	FROM- TO	VEHICULAR TRAFFIC CROSSFLOWS	** CURRENT ACCIDENT RATES (IF AVAILABLE)	PHYSICAL STREET, ETC. DESCRIPTION	BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
A1	Thru Stewart Park Area	Stewart Park Area to Central Avenue	None		Partially developed city park - Provision for bikeways in Master Plan		Bike Path Type A
AX1	Major crossing at Central Avenue	Across principal arterial	Existing ADT 2500 Projected ADT 2200*	3.65			Crosswalk Cautionary signing Signalization Overpass
A2	Thru Meadowlark Park area	Central Avenue to Broadwater Avenue	None		Undeveloped city park		Bike Path Type A
AX2	Major crossing at Broadwater Avenue	Across minor arterial	Existing ADT 4200 Projected ADT 2800*	4.38			Crosswalk Cautionary signing Signalization Overpass
A3	Thru Lillie Park area	Broadwater Avenue to Arnold Drain	None		Developed city park Partially developed bikeways		Bike Path Type A
AA	Along Arnold Drain easement	Lillie Park to 24th Street West	None		City store drain easement Undeveloped surface - Linear park potential		Bike Path Type A
AX3	Major crossing at 24th Street West	Across principal arterial	Existing ADT 13400 Projected ADT 7500*	16.02			Crosswalk Cautionary signing Signalization Overpass
A5	Along Arnold Drain easement	24th Street West to 20th Street West	None		City store drain easement - Undeveloped surface - Linear park potential		Bike Path Type A
AX4	Major crossing at 20th Street West and Belvedere Drive	Across "T" Type Intersection	Minor flows at: 20th Street West Belvedere Drive		Two-way traffic Two parking lanes Curb and gutter	No sidewalks No boulevard	Diagonal crosswalk Cautionary signing
A6	Along Arnold Drain easement	Belvedere Drive to 19th Street West	None		Two-way traffic Two parking lanes Curb and gutter		Bike Path Type A
AX5	Major crossing at 19th Street West	Across collector	Existing ADT 2600 Projected ADT 900*	43.84			Crosswalk Cautionary signing
A7	Along Arnold Drain easement	19th Street West to Alpine Village	Minor flows at: 19th Street West 17th Street West Lone Lane				Bike Path Type A

*Based on 1990 figures from Transportation Planning

**Number of accidents per year per million vehicle miles

B AVENUE E

BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
Inconsistent sidewalk and boulevard develop- ment	Bike Path Type C Bike Route Type A Type B Type C
	Crosswalk Cautionary signing
Inconsistent sidewalk and boulevard develop- ment	Bike Path Type C Bike Route Type A Type B Type C
	Crosswalk Cautionary signing Signalization
Good 4' sidewalks behind curbs No boulevards	Bike Path Type C Bike Route Type A Type B Type C

*B

ALIGNMENT B 18th STREET WEST BIKEWAY FROM SAINT PIUS SCHOOL TO AVENUE E

MAP CODE	ALIGNMENT SEGMENT	FROM - TO	VEHICULAR TRAFFIC CROSSFLOWS	** CURRENT ACCIDENT RATES (IF AVAILABLE)	PHYSICAL STREET, ETC. DESCRIPTION	BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
B1	18th Street West	Broadwater Avenue to Lewis Avenue	Wyoming Yellowstone Clark	NA	60' right-of-way Confined 2-way traffic Used parking lanes Curb and gutter	Inconsistent sidewalk and boulevard development	Bike Path Type C Bike Route Type A Type B Type C
BX1	Major crossing at Lewis Avenue	Across collector					Crosswalk Cautionary signing
B2	18th Street West	Lewis Avenue to Grand Avenue	Burlington Belvedere Alderson	NA	60' right-of-way Confined 2-way traffic Used parking lanes Curb and gutter	Inconsistent sidewalk and boulevard development	Bike Path Type C Bike Route Type A Type B Type C
BX2	Major crossing at Grand Avenue	Across principal arterial	Entering ADT 13200 Projected ADT 13500*	36.25			Crosswalk Cautionary signing Signalization
B3	18th Street West	Grand Avenue to Avenue E	Avenue B Avenue C Avenue D Avenue E	NA	60' right-of-way Confined 2-way traffic Used parking lanes Curb and gutter	Good 4' sidewalks behind curbs No boulevards	Bike Path Type C Bike Route Type A Type B Type C

*Based on 1990 figures from Transportation Plan

**Number of accidents per year per million vehicle miles

BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
	Bike Path Type A
	Crosswalk in association with Rose Park School Cautionary signing Signalization
Good 4' sidewalks Behind curb No boulevards	Bike Path Type C Bike Route Type A Type B Type C
	Crosswalk Cautionary signing Signalization
Good 4' sidewalks Behind curb No boulevards	Bike Path Type C Bike Route Type A Type B Type C
	(Future) Crosswalk Cautionary signing Signalization
Good 4' sidewalks Behind curb No boulevards	Bike Path Type C Bike Route Type A Type B Type C
	Crosswalk Cautionary signing Signalization
Good 4' sidewalks Behind curb No boulevards	Bike Path Type C Bike Route Type A Type B Type C
	Crosswalk Cautionary signing Signalization
Inconsistent sidewalk and boulevard develop- ment	Bike Path Type C Bike Route Type A Type B Type C
	Crosswalk Cautionary signing Signalization

ALIGNMENT C AVENUE E BIKEWAY FROM ROSE PARK TO PIONEER PARK

MAP CODE	ALIGNMENT SEGMENT	FROM- TO	VEHICULAR TRAFFIC CROSSFLOWS	** CURRENT ACCIDENT RATES (IF AVAILABLE)	PHYSICAL STREET, ETC. DESCRIPTION	BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
C1	Thru Rose Park area and Rose Park School	Rose Park area to 19th Street West	None		Developed city park Partially developed Bikeways		Bike Path Type A
CK1	Major crossing at 19th Street West	Across Collector					Crosswalk in association with Rose Park School Cautionary signing Signalization
C2	Avenue E	19th Street West to 17th Street West	18th Street West		60' right-of-way Confined 2-way traffic Used parking lanes Curb and gutter	Good 4' sidewalks Behind curb No boulevards	Bike Path Type C Bike Route Type A Type B Type C
CK2	Major crossing at 17th Street West	Across principal arterial	Existing ADT 8400 Projected ADT 11000s	20.93			Crosswalk Cautionary signing Signalization
C3	Avenue E	17th Street West to 15th Street West	16th Street West		60' right-of-way Confined 2-way traffic Used parking lanes Behind curb	Good 4' sidewalks Behind curb No boulevards	Bike Path Type C Bike Route Type A Type B Type C
CK3	Potential future major crossing at 15th Street West	Across potential arterial	Currently 15th Street West				(Future) Crosswalk Cautionary signing Signalization
C4	Avenue E	15th Street West to 13th Street West	14th Street West		60' right-of-way Confined 2-way traffic Used parking lanes Curb and gutter	Good 4' sidewalks Behind curb No boulevards	Bike Path Type C Bike Route Type A Type B Type C
CK4	Major Crossing at 13th Street West	Across Collector	Existing ADT 7200 Projected ADT (NA)	7.71			Crosswalk Cautionary signing Signalization
C5	Avenue E	13th Street West to 8th Street West	12th Street West 11th Street West 10th Street West 9th Street West		60' right-of-way Confined 2-way traffic Used parking lanes Curb and gutter	Good 4' sidewalks Behind curb No boulevards	Bike Path Type C Bike Route Type A Type B Type C
CK5	Major Crossing at 8th Street West	Across Collector	Existing ADT 2700 Projected ADT (NA)	9.02			Crosswalk Cautionary signing Signalization
C6	Avenue E	8th Street West to 6th Street West	7th Street West		60' right-of-way Confined 2-way traffic Rough pavement Used parking lanes Curb and gutter	Inconsistent sidewalk and boulevard development	Bike Path Type C Bike Route Type A Type B Type C
CK6	Potential major crossing at 6th Street West	Across potential arterial	Currently 6th Street West				Crosswalk Cautionary signing Signalization

*Based on 1990 figures from Transportation Plan

**Number of accidents per year per million vehicle miles

A

BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
4' sidewalks Boulevard developed	Bike Path Type C Bike Lane Type A Type B Type C
	Crosswalk Cautionary signing Signalization Overpass
	Bike Path Type A

*B

B STREET

BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
Developed boulevards 6' +/- sidewalks	Bike Path Type B C Bike Route Type A Type B Type C
	Crosswalk and cautionary signing, signalization in association with McKinley School

*B

ALIGNMENT C continued

MAP CODE	ALIGNMENT SEGMENT	FROM- TO	VEHICULAR TRAFFIC CROSSFLOWS	** CURRENT ACCIDENT RATES (IF AVAILABLE)	PHYSICAL STREET, ETC. DESCRIPTION	BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
C7	Avenue B	6th Street West to Virginia Lane			40' right-of-way Confined 2-way traffic Used parking lanes Curb and gutter	4' sidewalk Boulevard developed	Bike Path Type C Bike Lane Type A Type B Type C
CK7	Major Crossing at Virginia Lane	Across Principal Arterial	Existing ADT 6300 Projected ADT 4500*	24.24			Crosswalk Cautionary signing Signalization Overpass
CS	Thru Pioneer Park	Virginia Lane to 3rd Street West	None		Developed city park Existing access road has potential as Bikeway		Bike Path Type A

*Based on 1990 figures from Transportation Plan

**Number of accidents per year per million vehicle miles

ALIGNMENT D AVENUE C BIKEWAY FROM PIONEER PARK TO NORTH 32nd STREET

MAP CODE	ALIGNMENT SEGMENT	FROM- TO	VEHICULAR TRAFFIC CROSSFLOWS	** CURRENT ACCIDENT RATES (IF AVAILABLE)	PHYSICAL STREET, ETC. DESCRIPTION	BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
D1	Avenue C	Pioneer Park to North 32nd Street	3rd Street West 2nd Street West 1st Street West		40' right-of-way Confined 2-way traffic Used parking lanes Curb and gutter	Developed boulevards 6' +/- sidewalk	Bike Path Type B Type C Bike Route Type A Type B Type C
D21	Major crossing at North 32nd Street	Across collector	Existing ADT 2300 Projected ADT 4000*	18.90			Crosswalk and cautionary signing, signalization in association with McKinley School

*Based on 1990 figures from Transportation Plan

**Number of accidents per year per million vehicle miles

Aro NORTH PARK [North 19th Street]

BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
Wide boulevards 6' sidewalks	Bike Path Type B Type C Bike Lane Type C Bike Route Type A Type B Type C
	E.-W. stop signs now Crosswalk Cautionary signing Signalization
Wide boulevards 6' sidewalks	Bike Path Type B Type C Bike Lane Type C Bike Route Type A Type B Type C
	E.-W. stop signs now Crosswalk Cautionary signing Signalization
Wide boulevards 6' sidewalks	Bike Path Type B Type C Bike Lane Type C Bike Route Type A Type B Type C
	E.-W. stop signs now Crosswalk Cautionary signing Signalization
Wide boulevards 6' sidewalks	Bike Path Type B Type C Bike Lane Type C Bike Route Type A Type B Type C
	Crosswalk Cautionary signing Signalization
Wide boulevards 6' sidewalks	Bike Path Type B Type C Bike Lane Type C Bike Route Type A Type B Type C
	Crosswalks Cautionary signing
Wide boulevards 6' sidewalks except at North Park	Bike Path Type B Type C Bike Lane Type C Bike Route Type A Type B Type C
	Bike Path Type A

*B

ALIGNMENT E 8th AVENUE NORTH BIKEWAY FROM NORTH 32nd STREET TO NORTH PARK (North 19th Street)

MAP CODE	ALIGNMENT SEGMENT	FROM- TO	VEHICULAR TRAFFIC CROSSFLOWS	** CURRENT ACCIDENT RATES (IF AVAILABLE)	PHYSICAL STREET, ETC. DESCRIPTION	BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
E1	8th Avenue North	North 32nd Street to North 30th Street	North 31st Street		80' right-of-way 2 wide traffic lanes Used parking lanes Curb and gutter	Wide boulevards 6' sidewalks	Bike Path Type E Type C Bike Lane Type C Bike Route Type A Type E Type C
EX1	Major crossing at North 30th Street	Across minor arterial	Existing ADT 4400 Projected ADT 7700 ^a	19.99			S-W stop signs now Crosswalk Cautionary signing Signalisation
E2	8th Avenue North	North 30th Street to North 28th Street	North 29th Street (stop signs E-W)		80' right-of-way 2 wide traffic lanes Used parking lanes Curb and gutter	Wide boulevards 6' sidewalks	Bike Path Type E Type C Bike Lane Type C Bike Route Type A Type E Type C
EX2	Potential major crossing at North 28th Street	Proposed principal arterial					S-W stop signs now Crosswalk Cautionary signing Signalisation
E3	8th Avenue North	North 28th Street to North 27th Street			80' right-of-way 2 wide traffic lanes Used parking lanes Curb and gutter	Wide boulevards 6' sidewalks	Bike Path Type E Type C Bike Lane Type C Bike Route Type A Type E Type C
EX3	Major crossing at North 27th Street	Across principal arterial	Existing ADT 13800 Projected ADT 18000 ^a	13.51			S-W stop signs now Crosswalk Cautionary signing Signalisation
E4	8th Avenue North	North 27th Street to North 25th Street	North 26th Street		80' right-of-way 2 wide traffic lanes Used parking lanes Curb and gutter	Wide boulevards 6' sidewalks	Bike Path Type E Type C Bike Lane Type C Bike Route Type A Type E Type C
EX4	Potential major crossing at North 25th Street	Proposed principal arterial	Existing ADT 900 Projected ADT 16800 ^a	NA			Crosswalk Cautionary signing Signalisation
E5	8th Avenue North	North 25th Street to North 23rd Street			80' right-of-way 2 wide traffic lanes Used parking lanes Curb and gutter	Wide boulevards 6' sidewalks	Bike Path Type E Type C Bike Lane Type C Bike Route Type A Type E Type C
EX5	Major crossing at North 23rd Street	Across collector	Existing ADT 400 Projected ADT (NA)	36.84			Crosswalks Cautionary signing
E6	8th Avenue North	North 23rd Street to North 19th Street	North 22nd Street		80' right-of-way 2 wide traffic lanes Used parking lanes Curb and gutter	Wide boulevards 6' sidewalks except at North Park	Bike Path Type E Type C Bike Lane Type C Bike Route Type A Type E Type C
E7	Thru North Park area	Park facilities to 8th Avenue North	None		Developed city park No provisions for bikeways		Bike Path Type A

^aBased on 1990 figures from Transportation Plan

**Number of accidents per year per million vehicle miles

EASTERN MONTANA COLLEGE

BOULEVARD-SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
Wide boulevards 6' sidewalks	Bike Path Type B Type C
	Crosswalks Cautionary signing
Wide boulevards 6' sidewalks	Bike Path Type B Type C
Wide boulevards Inconsistent sidewalk development	Bike Path Type B Type C
	Crosswalks Cautionary signing Signalization
Wide boulevards Inconsistent sidewalk development	Bike Path Type B Type C
	Crosswalks Cautionary signing Signalization
	Bike Path Type A Type B Type C

ALIGNMENT F

NORTH 31st and LOCUST STREET BIKEWAY FROM 6th AVENUE NORTH TO EASTERN MONTANA COLLEGE

MAP CODE	ALIGNMENT SEGMENT	FROM- TO	VEHICULAR TRAFFIC CDSFFLOWS	** CURRENT ACCIDENT RATES (IF AVAILABLE)	PHYSICAL STREET, ETC. DESCRIPTION	BOULEVARD SIDEWALK DESCRIPTION	BIKEWAY DEVELOPMENT OPTIONS
F1	North 31st Street	6th Avenue North to 11th Avenue North	7th Avenue North 8th Avenue North 9th Avenue North 10th Avenue North		80' right-of-way Confined 2-way traffic Shared parking lanes Curb and gutter	Wide boulevards 6' sidewalks	Bike Path Type B Type C
F21	Major crossing at 11th Avenue North	Across collector	Existing ADT 700 Protected ADT (NA)	94.47			Crosswalks Cautionary signing
F2	North 31st Street	11th Avenue North to Locust Street	12th Avenue North McDonnell Boulevard Eleventh Avenue		80' right-of-way Confined 2-way traffic Shared parking lanes Curb and gutter	Wide boulevards 6' sidewalks	Bike Path Type B Type C
F3	Locust Street	North 31st Street to Grandview Boulevard			80' right-of-way Confined 2-way traffic Shared parking lanes Curb and gutter	Wide boulevards Inconsistent sidewalk development	Bike Path Type B Type C
F22	Major Crossing at Grandview Boulevard	Across minor arterial	Existing ADT 4100 Projected ADT 10300*	16.94			Crosswalks Cautionary signing Signalization
F4	Locust Street	Grandview Boulevard to Poly Drive	None		80' right-of-way Confined 2-way traffic Shared parking lanes Curb and gutter	Wide boulevards Inconsistent sidewalk development	Bike Path Type B Type C
F23	Major crossing at Poly Drive	Across minor arterial	Existing ADT 9200 Projected ADT 10300*	12.73			Crosswalks Cautionary signing Signalization
F5	Bikeways thru Eastern Montana College	Campus facilities to Locust Street	Minor				Bike Path Type A Type B Type C

*Based on 1990 figures from Transportation Plan

**Number of accidents per year per million vehicle miles.

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Special thanks also goes to Mayor Joseph A. Leone who is a proponent of the Bikeways and was instrumental in authorizing this report.

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Throughout the study, City Department personnel were very helpful in providing basic data, advice and encouragement. Their assistance and support is gratefully acknowledged.

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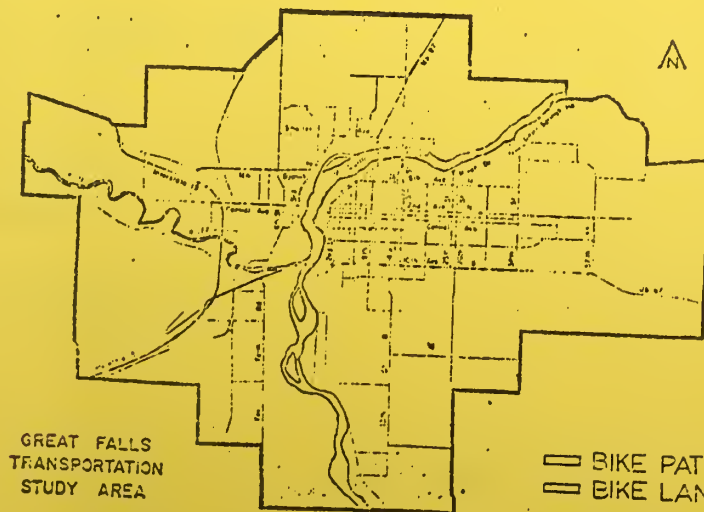
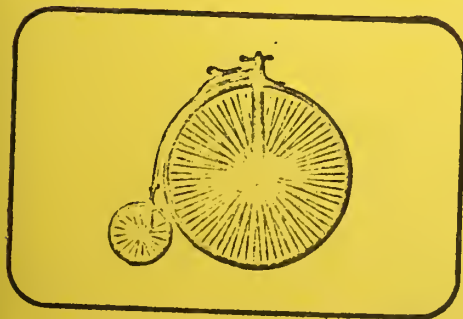
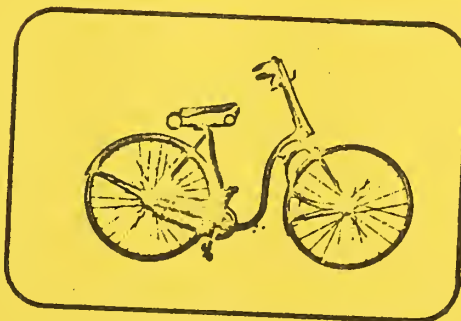
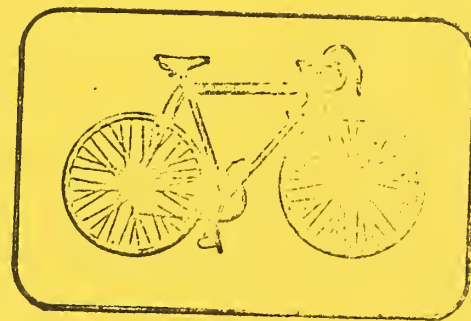
FRIENDS OF BIKECOLOGY

INDIVIDUALS

And, thank you, to all of the individuals who have contributed their ideas and enthusiasm for the Billings Bikeways.

BIKEWAY

PLAN

GREAT FALLS,
MONTANAGREAT FALLS
TRANSPORTATION
STUDY AREA— BIKE PATH
- - BIKE LANE
... BIKE ROUTE

GREAT FALLS
URBAN TRANSPORTATION STUDY

BIKEWAY PLAN

Prepared by
GREAT FALLS CITY-COUNTY PLANNING BOARD
in cooperation with
City of Great Falls
County of Cascade
and
Montana Department of Highways

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SUMMARY:

This report presents a plan for a comprehensive bikeway network in the Great Falls Urban area. The plan includes approximately 46 miles of bicycling facilities estimated to cost \$327,600 in 1976 dollars. Indications of funding possibilities and a proposed 20-year staging program are included.

The bicycling facilities chosen to be the final network were selected from four alternatives which were compared on the basis of eight evaluation criteria selected by the staff of the City-County Planning Board. Information relating to bicycle usage in the study area was compiled from a questionnaire administered in October 1975 by the Citizens Involvement Committee - Bikeway Task Force.

Recent changes in public attitude and federal action, coupled with the survey results lent support for the thorough examination of the potential of bikeway development in Great Falls.

Upon final approval by the Policy Coordinating Committee, the plan will be incorporated into the local transportation plan for implementation.

BIKEWAY PLAN

I. INTRODUCTION:

The increased availability of the bicycle, coupled with changes in public attitude toward recreation, conservation, and other environmental considerations has brought about a phenomenal growth in bicycle ownership across the nation. With this growth in cycling popularity and utilization has come both a demand for good recreational and utility oriented facilities on which to ride and an increased concern for bicycling safety. As a means of keeping pace with changing public attitudes, an attempt was made to study the effects of these changing attitudes and investigate the feasibility of using bicycles as an alternative mode of transportation in the Great Falls area.

Actions taken by the Great Falls Park and Recreation Board and the Great Falls Citizen's Involvement Committee in recent years have indicated a demand for bicycle related facilities. Recent Federal Department of Transportation actions promoting the development of balanced multi-modal transportation systems lend support to bikeway development. Recognizing these trends, the Policy Coordinating Committee of the Great Falls Urban Transportation Study set aside planning funds for a more thorough examination of the potential for a bikeway system in Great Falls.

The purpose of this report is to document this examination by presenting its methodologies, justifications, and results.

In the first part of the report the bicyclists attitude survey will be described. After methodology explanation, the survey results are presented in a number of displays.

Secondly, several alternative bikeway plans and a general explanation of each alternative are presented.

The alternative networks are analyzed and compared in the third section, and a recommended network is selected.

An investigation of financial resources and a schedule of improvements comprise the remaining sections.

II. 1975 BICYCLISTS SURVEY:

In the Fall of 1975, a joint effort was undertaken by the Citizen's Involvement Committee - Bikeway Task Force and the staff of the Great Falls City-County Planning Board to determine community need and interest in bicycling facilities and to design a network of bicycling facilities, if the determination so warranted.

During the first week of October, the Bikeway Task Force conducted a survey which was primarily directed toward bicyclists. This was accomplished by distributing approximately 17,000 surveys (Figure II-1) through the Great Falls Public School system. Approximately 1,700 survey forms were completed and returned for tabulation. This amounted to a 25.0% return of potentially surveyed households, assuming 2.5 children per household.

Concern was expressed at the outset of the survey that a biased survey was used, that confusion would result regarding the exact definition of a "trip" and that it would be nearly impossible to expand the sample to the entire area population. All these points were considered and a decision was made to proceed with the survey, treating it as an attitude survey of primarily bicyclists. It can be said in retrospect, however, that a well-distributed sample, geographically speaking, was obtained and that the survey did provide an indication of bicycling travel patterns.

Portions of the survey were tabulated by computer and the other portions by hand. Survey questions 1 - 13 were computer tabulated. Table II-1 presents the results of the tabulation.

1975 BICYCLIST ATTITUDE SURVEY

1 ADDRESS OF RESIDENCE _____ 2 NUMBER OF PERSONS IN HOUSEHOLD _____ 3 NUMBER OF BICYCLES IN HOUSEHOLD _____	CITIZEN INVOLVEMENT COMMITTEE BIKEWAY TASK FORCE
---	--

Complete a separate column for each bicycle rider in your family by filling in the boxes with the requested information or by placing an X in the appropriate box.

4 NO. OF BIKE RIDERS IN FAMILY		BIKER 1	BIKER 2	BIKER 3	BIKER 4	BIKER 5	BIKER 6
5 AGES OF BIKER RIDERS							
6 ESTIMATED NO. OF TRIPS/BIKE							
7 AVERAGE LENGTH OF TRIP IN MILES							
8 USUAL PURPOSE OF BIKE TRIP	WORK						
	RECREATION						
	SHOPPING						
	SCHOOL						
	OTHER						
9 BIKE USED PRIMARILY ON	WEEKDAYS						
	Morning						
	Afternoon						
	Evening						
	WEEKENDS						
10 DO YOU FEEL SAFE WHEN BICYCLING ON CITY STREETS?	YES						
	NO						
11 IF NO, SPECIFY REASON(S)	HEAVY TRAFFIC						
	CARELESS MOTORIST						
	STREET CONDITIONS						
	OTHER BIKERS						
	OTHER						
12 IF FUNDS FOR BIKEWAYS WERE NEEDED WHICH MEANS WOULD YOU SUPPORT	AVAILABLE FUNDS						
	PRESENT ROAD TAX						
	SPECIAL BIKE TAX						
13 IF BIKEWAYS WERE PROVIDED WOULD YOU USE THEM?	NEVER						
	SOMETIMES						
	FREQUENTLY						

COMMENTS: (Use Back if Needed)

14 BICYCLE TRIP DESTINATIONS: (List the two (2) most frequent trips and frequency of trips for each biker in household. Please specify as precisely as possible addresses or locations where trips begin or end).

EXAMPLE:

FROM: 1515 11th Ave. So. TO: 1408 4th Ave. N. TRIPS/WEEK 3

BIKER #1:

FROM: _____ TO: _____ TRIPS/WEEK _____
 FROM: _____ TO: _____ TRIPS/WEEK _____

BIKER #2:

FROM: _____ TO: _____ TRIPS/WEEK _____
 FROM: _____ TO: _____ TRIPS/WEEK _____

BIKER #3:

FROM: _____ TO: _____ TRIPS/WEEK _____
 FROM: _____ TO: _____ TRIPS/WEEK _____

BIKER #4:

FROM: _____ TO: _____ TRIPS/WEEK _____
 FROM: _____ TO: _____ TRIPS/WEEK _____

BIKER #5:

FROM: _____ TO: _____ TRIPS/WEEK _____
 FROM: _____ TO: _____ TRIPS/WEEK _____

BIKER #6:

FROM: _____ TO: _____ TRIPS/WEEK _____
 FROM: _____ TO: _____ TRIPS/WEEK _____

DO NOT
USE THIS SPACE

○ ○ ○	○ ○ ○	○
○ ○ ○	○ ○ ○	○
○ ○ ○	○ ○ ○	○
○ ○ ○	○ ○ ○	○
○ ○ ○	○ ○ ○	○
○ ○ ○	○ ○ ○	○
○ ○ ○	○ ○ ○	○

15 Rank the following items in the order which you would like to see them carried out. Place a "1" beside the item you consider most important, "2" beside the second most important and so on.

- | | | |
|--|--|-----------------------------------|
| — Better Enforcement of Laws—
Bicyclists & Motorists. | — Street Repairs for Consid—
eration of Bikes | — Update Traffic Laws |
| — Better Education of Bicy—
clists & Motorists | — Registration of Bicycles | — Enforcement of Dog Leash
Law |
| — Stronger Laws Against Theft | — Better Street Lighting | — Other (Specify) |

TABLE II-1

BICYCLISTS ATTITUDE SURVEY RESULTS

- 1) Total Surveys: 1659
 Total Persons Surveyed 6982
 % of Total Population Surveyed 9.4%
- 2) Total Bicycles in Households: 5115
 Mean Bicycles/Household: 3.1
 Total Bicyclists: 4904
 % Bicyclists/Persons Surveyed: 63.8%
- 3) Age breakdown of Bicyclists Surveyed (Yrs.)

<u>AGE</u>	<u>TOTAL/GROUP</u>	<u>% TOTAL</u>
(0-4)	54	1.1
(5-11)	1883	38.5
(12-18)	1611	32.9
(19-30)	441	9.0
(>30)	907	18.5
TOTAL	4896	100.0

- 4) Total Number of Bike Trips/Week: 32,366
 Mean Number of Bike Trips/Week/Biker: 6.6
 Mean Number of Bike Trips/Week/Household 14.3
 Mean Trip Length (Miles): 1.4
 Distribution of Trip Lengths (Miles):

<u>MILES</u>	<u>TOTAL/GROUP</u>	<u>% TOTAL</u>
(< 1/2)	767	21.6
(1/2-1)	864	24.4
(1-3)	1521	42.9
(3-5)	232	6.6
(>5)	161	4.5
TOTAL	3545	100.0

- 5) Totals for Each Purpose of Bicycling:

<u>PURPOSE</u>	<u>TOTAL/PURPOSE</u>	<u>% TOTAL</u>
Work	349	5.0
Recreation	4145	59.4
School	770	11.0
Shopping	1138	16.3
Other	580	8.3
TOTAL	6982	100.0

TABLE II-1
(CONTINUED)

6) Responses for Time of Day Biking:

WEEKDAYS:

Morning	1255
Afternoon	2513
Evening	2263
TOTAL	6031

WEEKENDS:

TOTAL	3086
-------	------

Mean Trips/Weekday: 1206

Mean Trips/Weekend day: 1543

7) Responses to Safety Question, (Do you feel safe when bicycling on city streets?):

<u>RESPONSE</u>	<u>TOTAL/RESPONSE</u>	<u>% TOTAL</u>
Yes	1490	33.4
No	2965	66.6
TOTAL	4455	100.0

Reasons for a "No" Response to Safety Question:

<u>REASON</u>	<u>TOTAL/REASON</u>	<u>% TOTAL</u>
Heavy Traffic	1885	33.9
Careless Motorists	2205	39.6
Street Conditions	1066	19.1
Other Bikers	98	1.8
Other	313	5.6
TOTAL	5567	100.0

8) Responses to Funding Questions, (If funds for bikeways were needed which means would you support?):

<u>SOURCE</u>	<u>TOTAL/SOURCE</u>	<u>% TOTAL</u>
Available funds	1953	47.1
Present Road tax	1482	35.7
Special Bike Tax	715	17.2
TOTAL	4150	100.0

9) Responses to Question, (If bikeways were provided would you use them?):

<u>RESPONSE</u>	<u>TOTAL/RESPONSE</u>	<u>% TOTAL</u>
Never	121	2.6
Sometimes	1678	36.0
Frequently	2857	61.4
TOTAL	4656	100.0

TABLE II-1
(CONTINUED)

10) Two Way Matrix - Age vs. Purpose

<u>AGE</u>	<u>WORK</u>	<u>RECREATION</u>	<u>SHOPPING</u>	<u>SCHOOL</u>	<u>OTHER</u>
0-4	0	48	5	3	2
5-11	29	1585	192	675	162
12-18	130	1351	387	419	296
19-30	74	371	67	26	41
>30	116	790	119	15	79

11) Ranking Matrix - Activity vs. Order

ACTIVITY	1	2	3	4	5	6	7	8	9
Better Enforcement	376	285	173	142	124	89	67	28	7
Better Education	257	302	227	157	122	98	78	45	5
Stronger Theft Laws	250	216	210	173	152	118	117	44	6
Street Repairs	223	155	196	183	157	150	110	58	0
Bicycle Registration	50	106	150	174	202	176	160	161	10
Better Lighting	90	116	120	148	154	199	193	160	6
Update Traffic Laws	29	76	116	154	195	206	251	126	6
Dog Leash Enforcemnt	107	118	82	93	78	102	141	421	30
Other	30	9	8	5	5	11	6	21	108

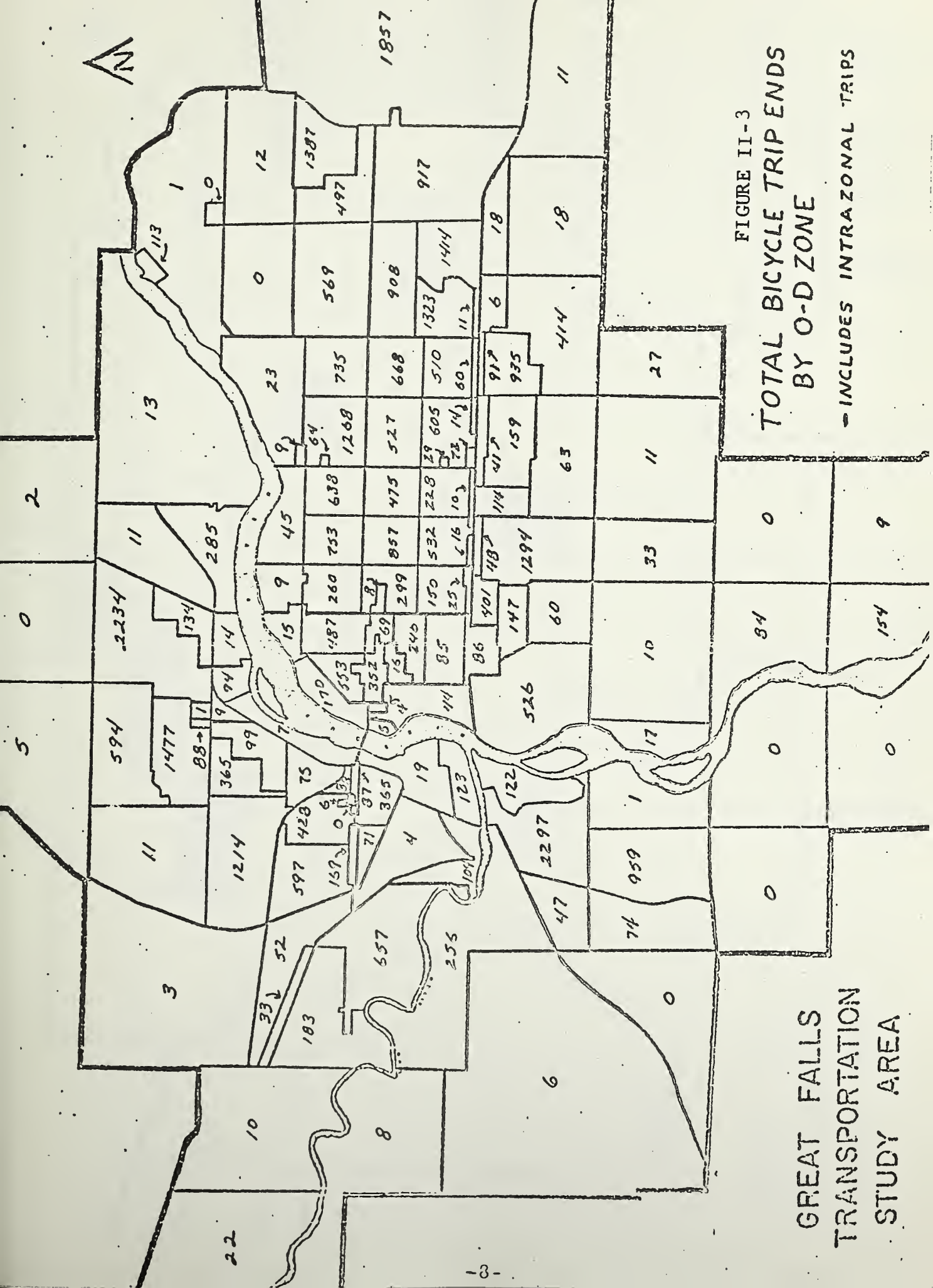
Survey questions 14 and 15 presented somewhat of a problem for computer tabulation. Therefore, it was elected to tabulate this portion by hand.

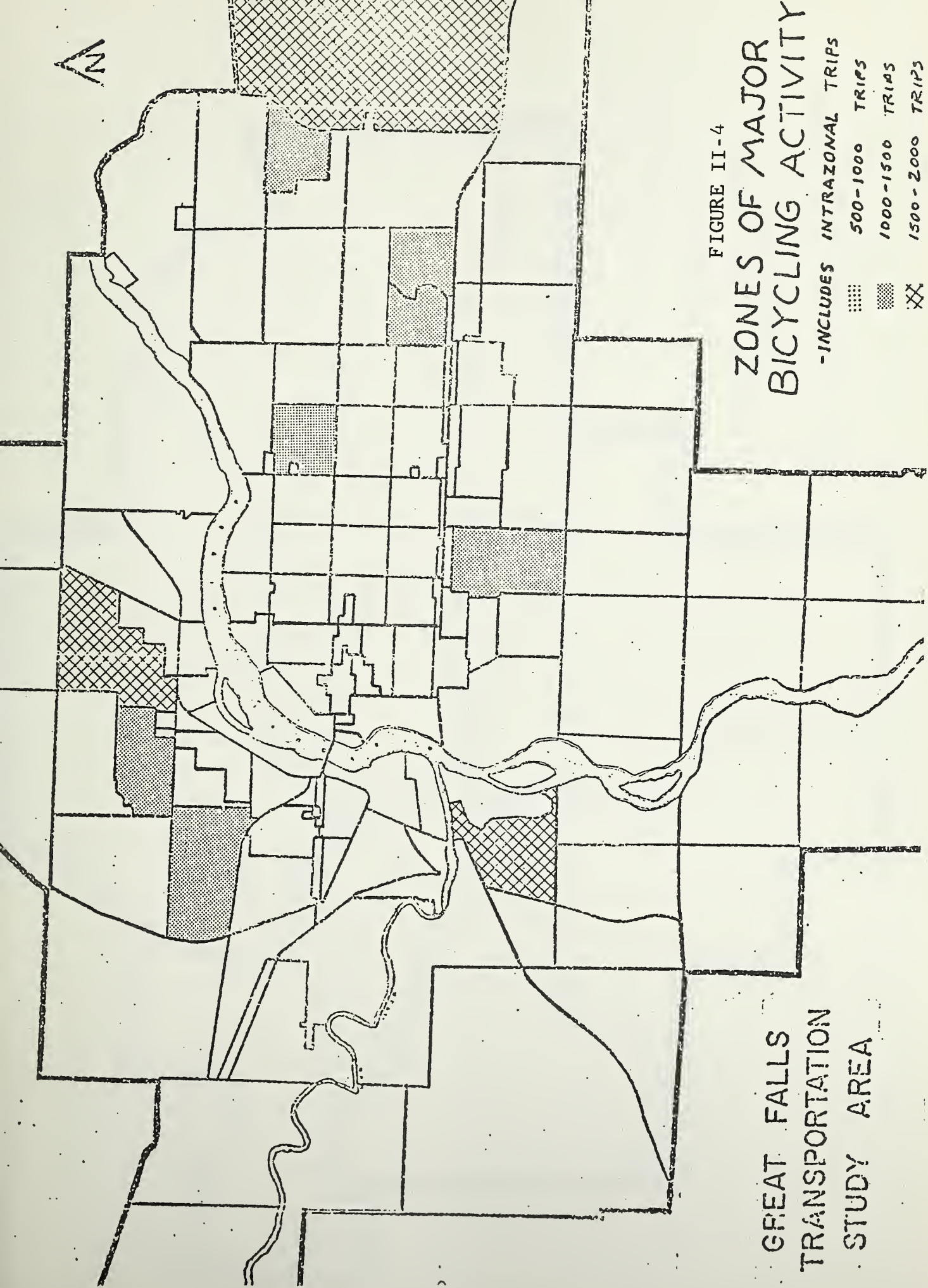
The primary purpose of question #14 was to determine the origins and destinations of bicycle trips and the frequency of those trips. This was accomplished by requesting that each bicyclist in the household specify the addresses or locations where his two most frequent trips began and ended and the number of such trips per week.

Using the traffic analysis zones for the Great Falls Urban Transportation Study Area, each origin and destination address for each bicycle trip was coded with an origin-destination zone, centroid number. Additionally, the frequency of trips from origin to destination were recorded. Figure II-3 gives an example of a response to question #14 of the survey, and the results of the coding process.

FIGURE II-2

14 BICYCLE TRIP DESTINATIONS: (List the two (2) most frequent trips and frequency of trips for each biker in household. Please specify as precisely as possible addresses or locations where trips begin or end).																																	
EXAMPLE: FROM: 1515 11 th Ave. So. TO: 1408 4 th Ave. No. TRIPS/WEEK 3																																	
BIKER #1: FROM: 1245 PARK GARDEN TO: 3012 CARMEL TRIPS/WEEK 2 FROM: _____ TO: _____ TRIPS/WEEK _____																																	
BIKER #2: FROM: 1245 PARK GARDEN TO: 3012 CARMEL TRIPS/WEEK 1 FROM: _____ TO: _____ TRIPS/WEEK _____																																	
BIKER #3: FROM: 1245 PARK GARDEN TO: 24-25 th ST. S.W. TRIPS/WEEK 6 FROM: _____ TO: _____ TRIPS/WEEK _____																																	
BIKER #4: FROM: 1245 PARK GARDEN TO: 26 th AVE S.W. TRIPS/WEEK 4 FROM: _____ TO: _____ TRIPS/WEEK _____																																	
BIKER #5: FROM: _____ TO: _____ TRIPS/WEEK _____ FROM: _____ TO: _____ TRIPS/WEEK _____																																	
BIKER #6: FROM: _____ TO: _____ TRIPS/WEEK _____ FROM: _____ TO: _____ TRIPS/WEEK _____																																	
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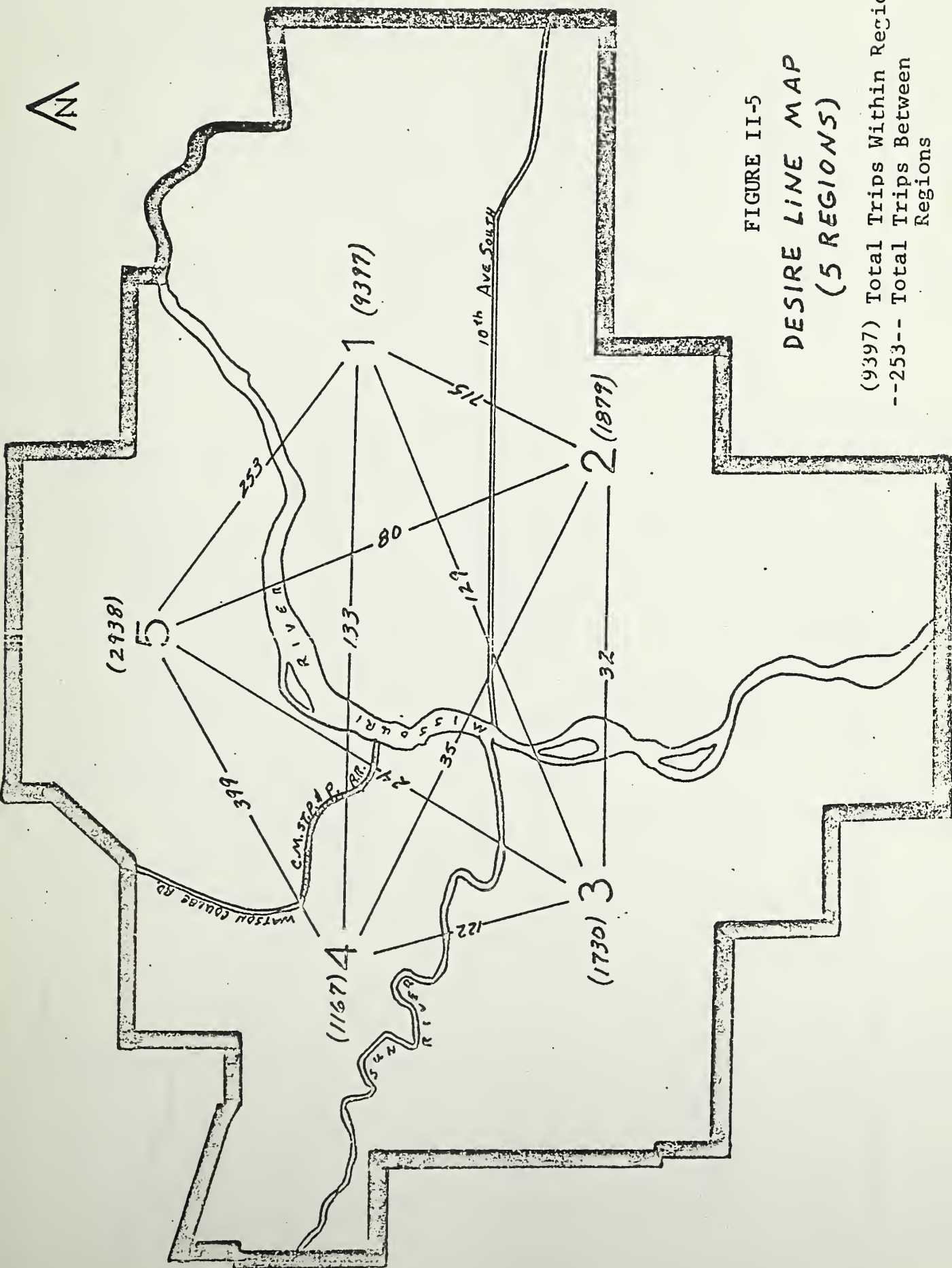


FIGURE II-5

DESIRE LINE MAP (5 REGIONS)

(9397) Total Trips Within Region
--253-- Total Trips Between Regions

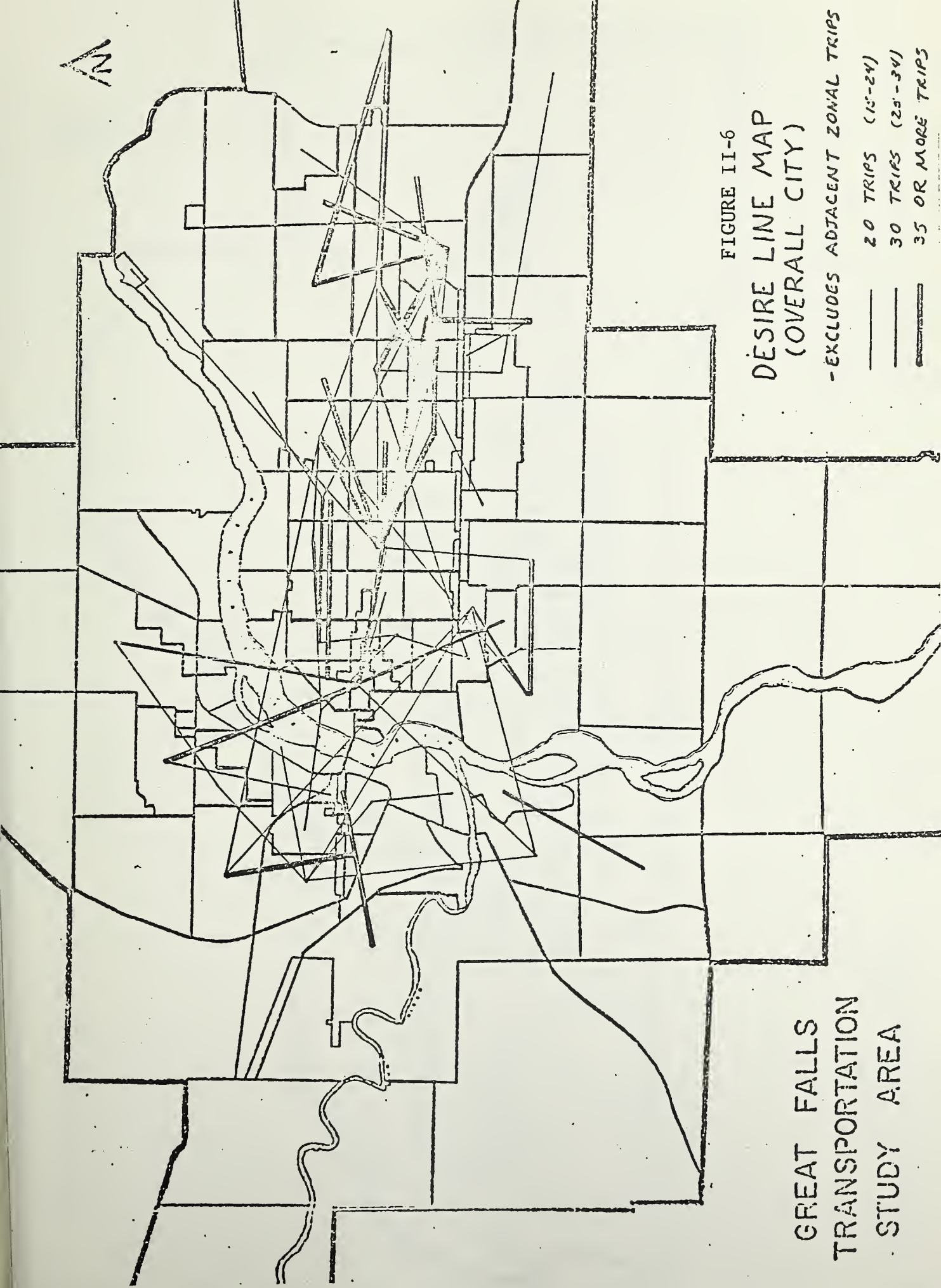


FIGURE II-6

DÉSIRE LINE MAP
(OVERALL CITY)

-EXCLUDES ADJACENT ZONAL TRIPS

- 20 TRIPS (15-24)
- 30 TRIPS (25-34)
- 35 OR MORE TRIPS

GREAT FALLS
TRANSPORTATION
STUDY AREA

REGION # 1

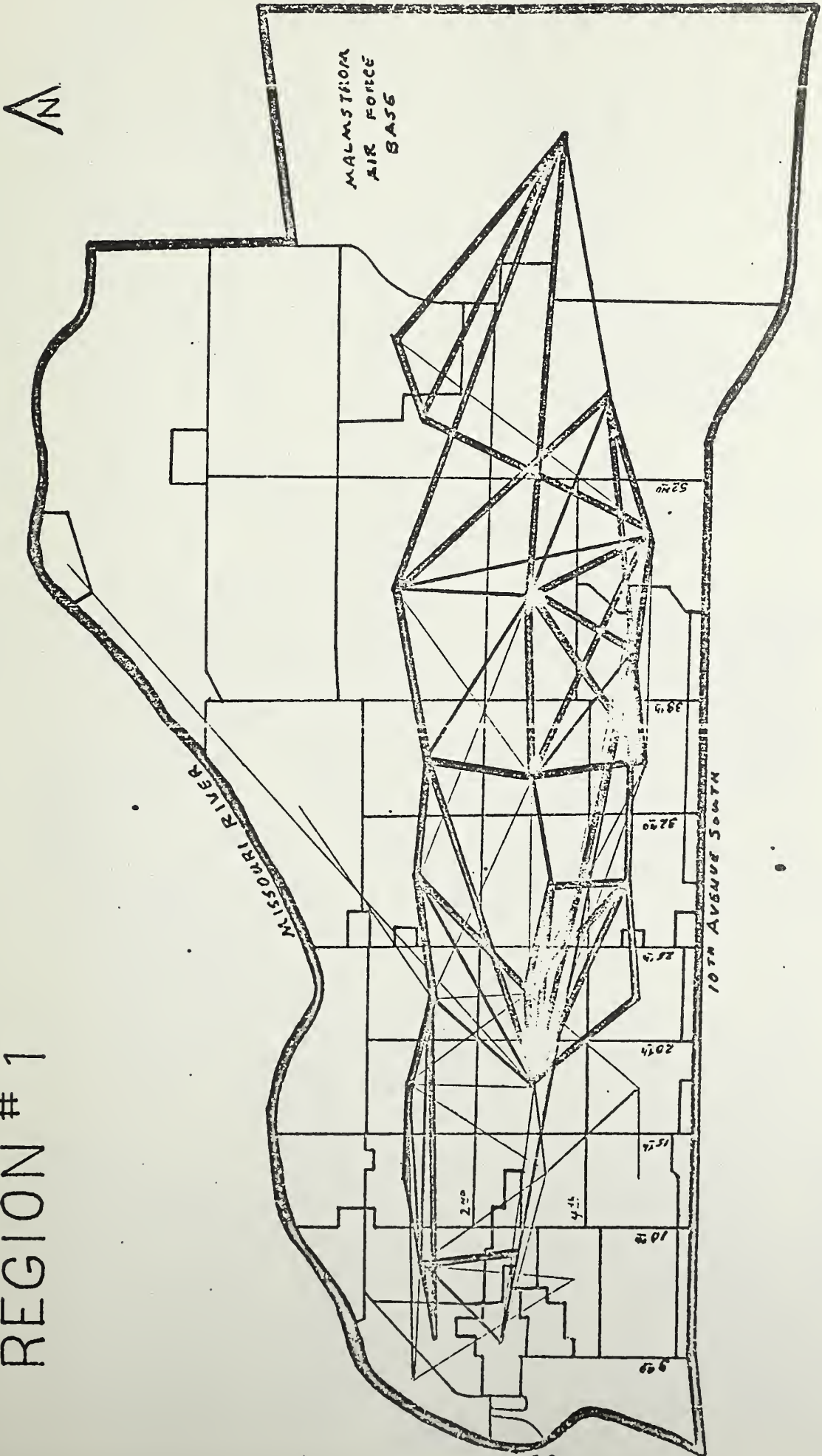


FIGURE II-7
 DESIRE LINE MAP
 (REGION 1)
 -INCLUDES ADJACENT ZONAL TRIPS

- 20 TRIPS (15-24)
- == 30 TRIPS (25-34)
- === 35 OR MORE TRIPS

GREAT FALLS, MONT.

ARMSTRONG LUMBER & PAPER COMPANY

PARK GROUNDS

PAUL W. GIP

MOUNT
OLIVER
CEMETERY

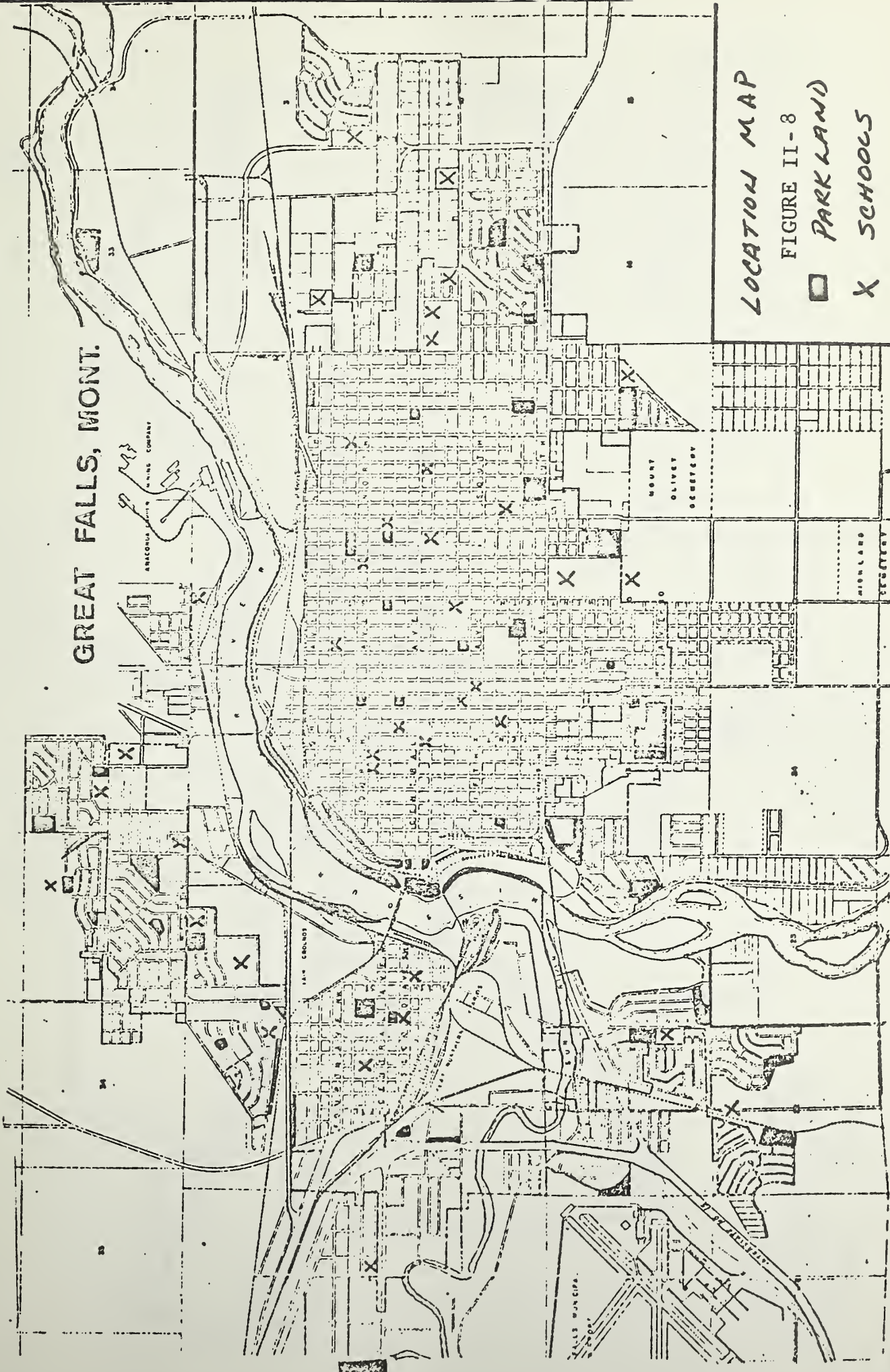
HIGHLAND
CEMETERY

LOCATION MAP

FIGURE II-8

PARK LAND

SCHOOLS



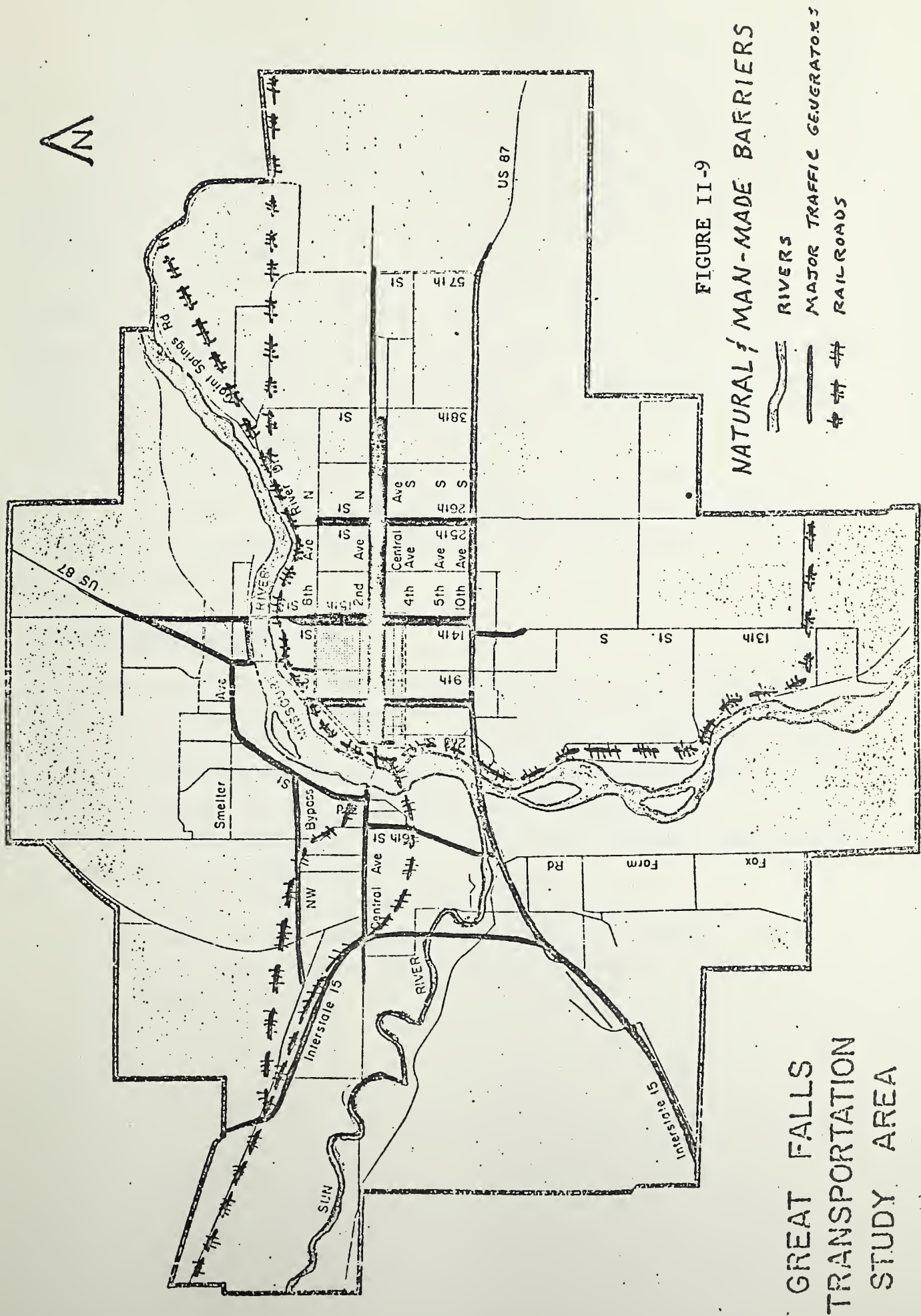


FIGURE II-9

NATURAL & MAN-MADE BARRIERS

GREAT FALLS
TRANSPORTATION
STUDY AREA

Using a cross-reference matrix, bicycle trip tables from and to the various traffic analysis (O-D) zones were produced. This data was reduced in a number of different ways, as illustrated in Figures II-3 through II-7.

A total of 38,138 bicycle trip ends (i.e. 19,069 trips) were recorded for the one-week period. 49.6% of these trips were made within zones or to an adjacent zone. These constituted the shorter, neighborhood-type trips. In some of the analysis which follows, the longer trips have been considered separately from the shorter neighborhood trips.

For informational and analytical purposes Figures II-8 and II-9 are presented. This information was used as points for consideration, primarily during the design of the various bikeway alternatives.

III BIKEWAY ALTERNATIVES:

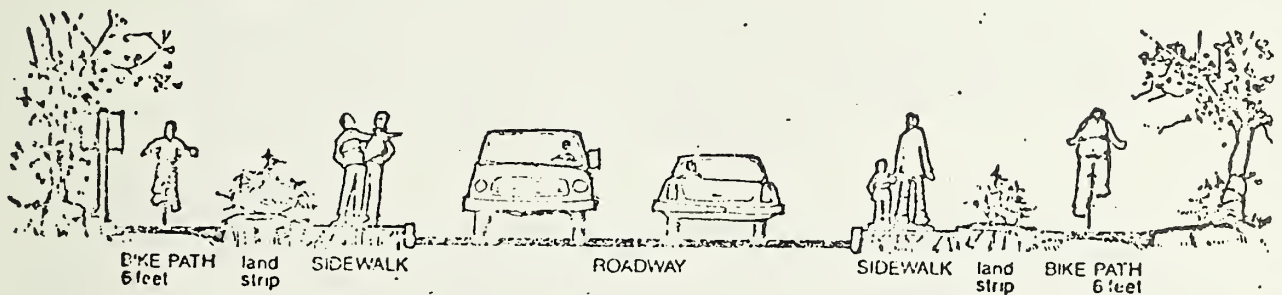
Upon completion of the data gathering and analytical process, a large number of bikeway route structures and concepts were prepared and considered. Ultimately these were reduced to four major alternatives representing a range of bikeway route configurations, plus a fifth "no-build" alternative.

In the descriptions which follow, the following definitions of bikeways are used (see Figure III-1):

1. Bikeway - any system of bicycling facilities.
2. Bike Path - a designated right-of-way separated from vehicular traffic except for cross flows and some pedestrian use.

BICYCLE FACILITY DESIGNS

Bike Path •



Bike Lane •



Bike Route •



3. Bike Lane - a shared segment of street for the exclusive use of bicycling except for cross flows. A bike lane can be separated from traffic by painted stripes or more effectively from a safety standpoint by low barriers.
4. Bike Route - a designated street that the bicyclist and motorist share. Signing or stenciling on the pavement denotes route locations.

Alternative 1.

The results of the Bicyclists Survey indicate that the majority of bicycle trips are recreation oriented. Although the type, location, and extent of recreational bicycling are not precisely known, this network (Figure III-2) was designed primarily to satisfy a recreational demand and to encourage bicycling along the Missouri River and Gibson Park areas, since both are ideally suited for this purpose.

Due to the nature of recreational bicycling, a separate facility (bike path) is desirable. This allows for uninterrupted travel, limited vehicular conflicts, leisure bicycling and sight seeing opportunities. A bicycle path along the river is not only enjoyable, but functional. It serves as a link between two major recreational attractions - Gibson Park and Giant Springs.

In designing the network, an assumption was made that given a recreational facility of this magnitude, bicyclists would determine their own route of access to and from the facility. A more implicit (and more fundamental) assumption is that cycling should be regarded as a strictly recreational activity and that facilities to promote bicycling should be designed accordingly. Therefore, no attempt was made to provide designated routes of access to and from the facility.

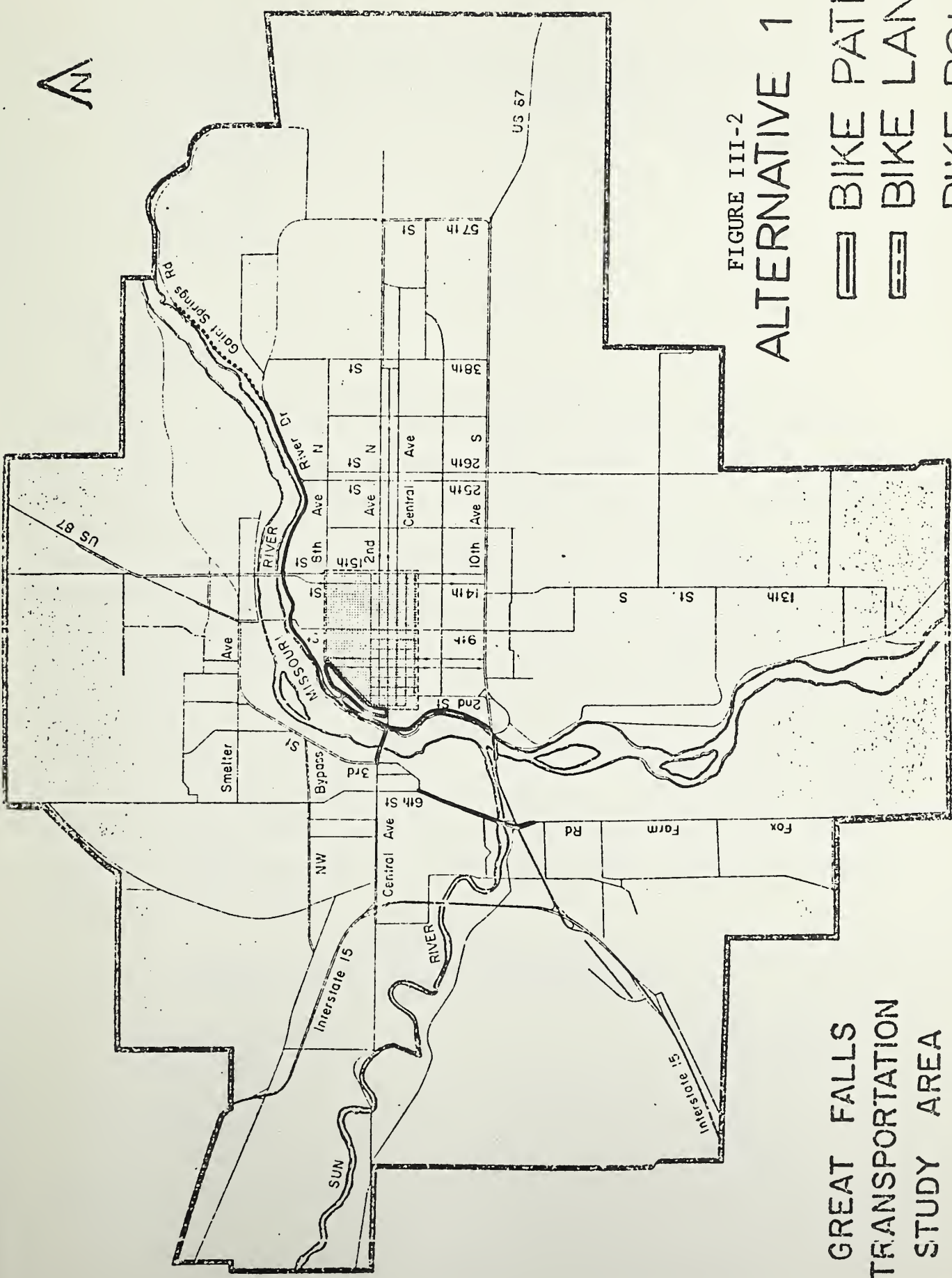


FIGURE III-2

ALTERNATIVE 1

GREAT FALLS
TRANSPORTATION
STUDY AREA

- BIKE PATH
- BIKE LANE
- BIKE ROUTE

TABLE III-1

BIKEWAY ROUTE MILEAGE, ALTERNATIVE 1.

<u>Type of Facility</u>	<u>Route Miles</u>
Bike Path	8.30
Bike Lane	0
Bike Route	<u>1.36</u>
Total	9.66

Alternative 2.

This alternative (Figure III-3) attempts to provide the "skeletal" essentials of an all purpose network for recreation, work, shopping, and school uses. The network provides access to and from the areas of greatest bicycling activity, as specified by the Bicyclists Survey. Movement in an east-west fashion is provided to Gibson Park, River Road, downtown, Malmstrom Air Force Base, and activities along 10th Avenue South, including Holiday Village, and the College of Great Falls. All north-south movement is adequately spaced to provide collector links between all east-west movement. Neighborhood streets are selected over and above major arterials. In so doing, the system avoids conflict areas and aligns in close proximity with schools, parks, and internal neighborhood movement. Additionally, neighborhood streets serve the needs of many trip types, such as, internal neighborhood trips, cross-city trips, leisure trips and limited utility trips.

TABLE III-2

BIKEWAY ROUTE MILEAGE, ALTERNATIVE 2.

<u>Type of Facility</u>	<u>Route Miles</u>
Bike Path	4.77
Bike Lane	2.56
Bike Route	<u>14.48</u>
Total	21.81

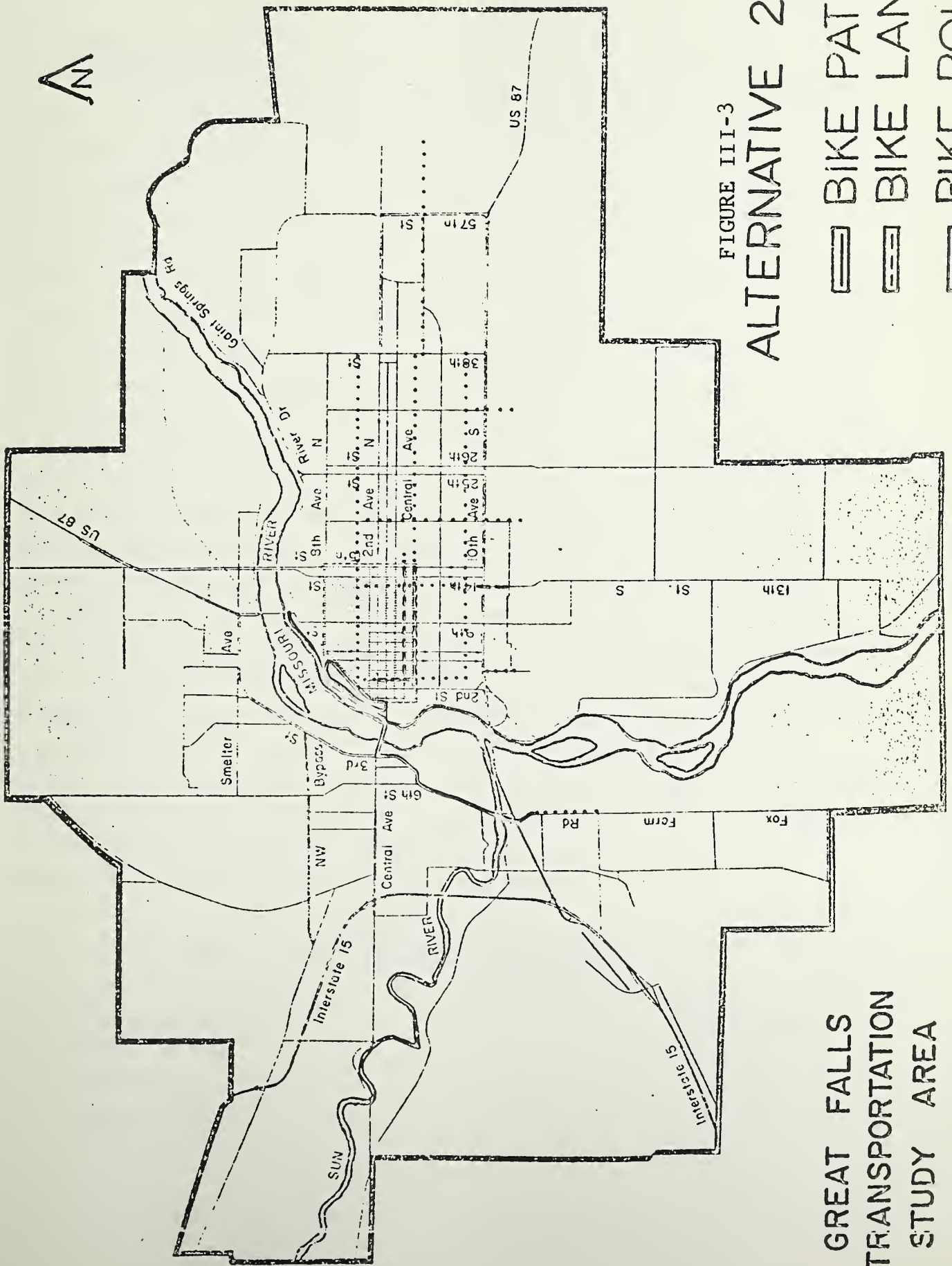


FIGURE III-3
ALTERNATIVE 2

GREAT FALLS
TRANSPORTATION
STUDY AREA

-  BIKE PATH
-  BIKE LANE
-  BIKE ROUTE

Alternative 3.

Alternative 3 (Figure III-4) proposes a network of combined usage for such trips as recreation, work, shopping, and school. Of major attraction are the bike path facilities at Gibson Park and along River Drive. Continuity of east-west and north-south movement is provided primarily for utility oriented activities, as well as access to and from the bike path facilities. The spatial design of the alternative provides convenient access to any link in the network. In most cases, a cyclist need not ride more than four blocks to intercept a bicycling facility which will provide direct access to any section of the city. Facility designs involving minimal costs (i.e. bike routes) were selected, except for the special recreation facilities planned at Gibson Park and along River Drive, and in situations where the safety hazard caused by high auto traffic volumes suggested the use of bike lanes. Neighborhood streets, which provide continuity and service to as many local parks and schools as possible were selected over and above high volume arterials. River crossings were limited to those bridges which are planned to have future bike lane facilities. Three crossings at 10th Avenue South were provided to minimize vehicular/bicyclist conflicts and to provide links to major generators south of Tenth, such as Holiday Village, the College of Great Falls, and Russell Addition. Routes were also designed in such a manner as to reduce the need for right-of-way acquisition and to minimize conflicts with on-street parking.

TABLE III - 3

BIKEWAY ROUTE MILEAGE, ALTERNATIVE 3.

<u>Type of Facility</u>	<u>Route Miles</u>
Bike Path	7.12
Bike Lane	13.58
Bike Route	25.36
Total	46.06

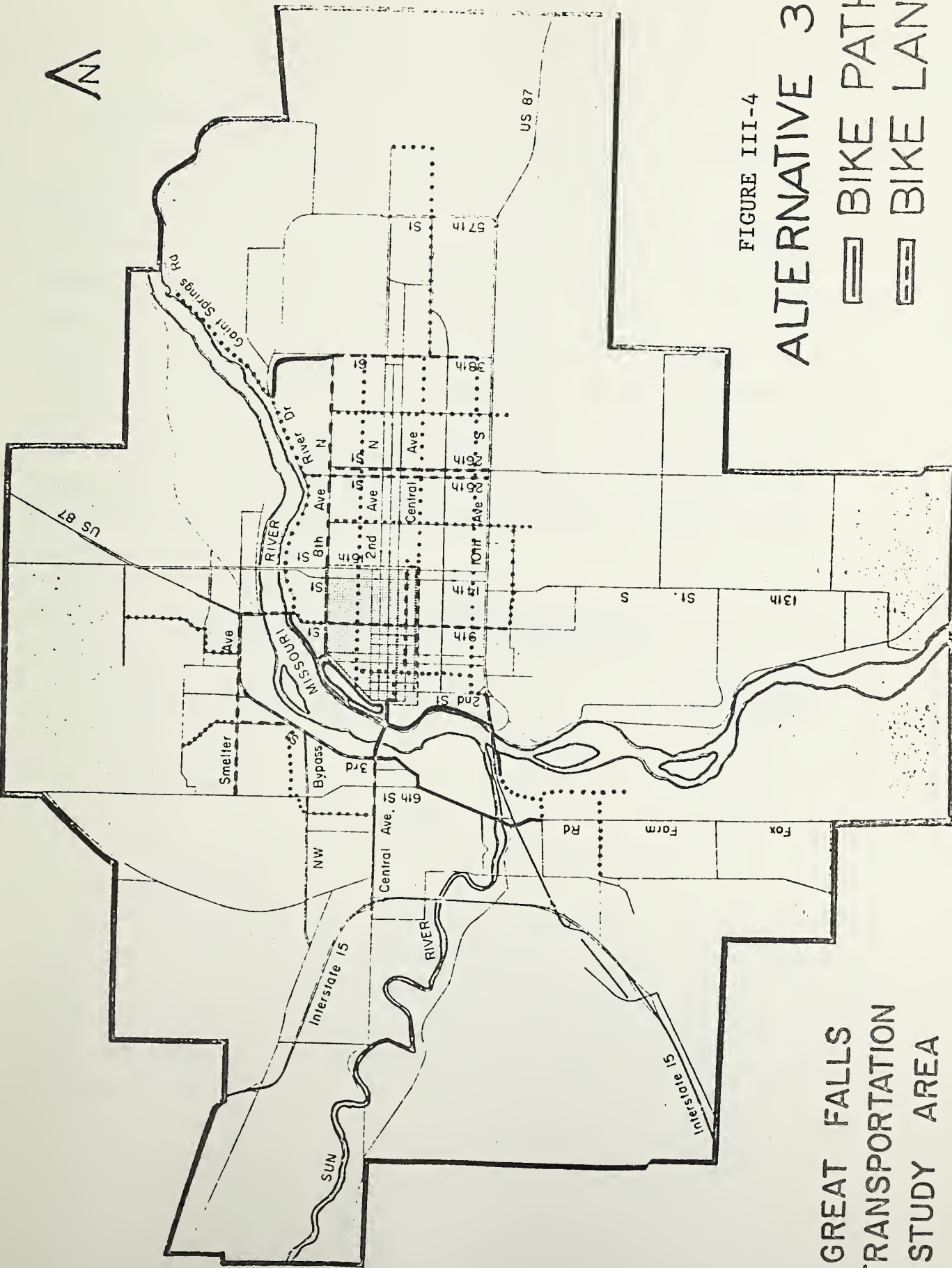
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FIGURE III-4

ALTERNATIVE 3

- BIKE PATH
- BIKE LANE
- BIKE ROUTE

GREAT FALLS
TRANSPORTATION
STUDY AREA



Alternative 4.

Alternative 4 (Figure III-5) is designed to accommodate all trips associated with work, shopping, school, etc. As an all-utility network, it provides for through traffic as much as possible. In general, the system follows the major highway network, using arterial streets where possible. Direct routing and expedient travel time are of major concern. It should be noted here that bicyclist safety declines on a network of this nature if special effort is not made to reduce vehicular/bicyclist conflicts. A key assumption of this alternative is that leisure and neighborhood bicycling activities are well taken care of by local streets, and special facilities are needed primarily by those cyclists who wish to make longer distance trips.

TABLE III-4

BIKEWAY ROUTE MILEAGE, ALTERNATIVE 4.

<u>Type of Facility</u>	<u>Route Miles</u>
Bike Path	1.97
Bike Lane	30.90
Bike Route	<u>9.25</u>
Total	42.12

Alternative 5.

Alternative 5 is the "no-build" alternate. It calls for the construction of no bicycling facilities. Its key assumption is that cyclists may "share the road" with automobiles on all local streets except the Interstate highway and have been doing so for many years. It is undoubtedly the least costly of the five alternatives.

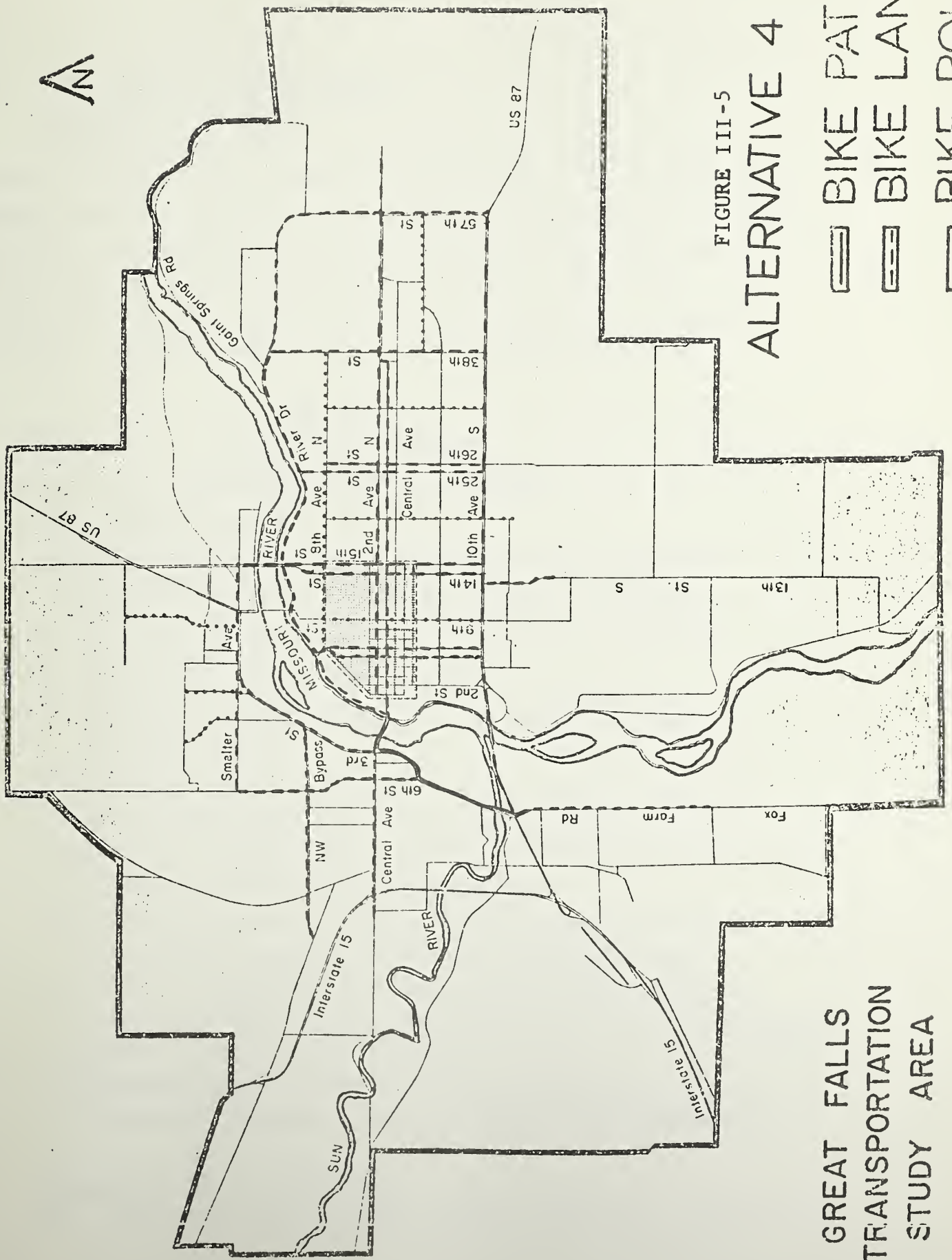


FIGURE III-5

ALTERNATIVE 4

GREAT FALLS
TRANSPORTATION
STUDY AREA

IV. RECOMMENDED BIKEWAY NETWORK:

Evaluation Criteria:

Comparison and evaluation of the five alternatives was made on the basis of criteria established by the study staff. After reviewing a number of publications concerned with bikeway planning and design, and considering attitudes expressed by bicyclists in the 1975 Bicyclists Survey in Great Falls, the staff decided upon eight criteria to be used for evaluation purposes. These criteria are listed in Table IV-1.

TABLE IV-1

EVALUATION CRITERIA

FOR BIKEWAY NETWORK ANALYSIS

The Network should:

- 1) Utilize existing street facilities and currently planned bicycling facilities wherever possible.
- 2) Minimize vehicular/bicyclist conflicts and avoid high volume auto traffic areas.
- 3) Provide facilities which will accommodate both internal neighborhood trips and longer distance "through" trips.
- 4) Maximize access to major bike trip generators such as schools, parks, libraries and shopping centers.
- 5) Provide a system which will accommodate both recreation-oriented and utility-oriented trips.
- 6) Provide convenient access to the network from any residential neighborhood in the urbanized area.
- 7) Create a comprehensive, long-range system which is capable of serving current as well as future anticipated needs of the bicycling public.
- 8) Require minimal amounts of right of way acquisition and in general minimize costs of bikeway implementations.

Comparison of Alternatives:

The eight evaluation criteria listed above were used to

compare the first four alternate networks. In some cases a quantitative analysis was possible; in others it was not, and a certain amount of judgement was exercised by the study staff. The following sections describe the comparisons which were made by the staff.

1. Utilization of existing and currently planned bicycling facilities.

Bike lanes and bike routes both make use of existing road surfaces. Bike paths, however, require the construction of a new facility and in some cases may require acquisition of right-of-way or obtaining of easements. Table IV-2 gives an indication of the amounts of new construction required by each of the four alternative networks.

It can be seen that alternative 4, which is composed of bike routes and lanes only, requires fewer miles of new construction than the other three alternatives. Alternatives 1, 2 and 3 are differentiated primarily by the length of bike path facilities required along the Missouri River. Alternative 3 also includes a facility which none of the others include: a ramp at the west end of Warden Bridge (the new span which is planned) to carry bicyclists down from the elevated highway grade and under Tenth Avenue South, connecting with a bike path parallel to and south of Tenth Avenue South. This is based on a bridge location north of the existing structure.

TABLE IV-2

BIKE PATH CONSTRUCTION REQUIREMENTS BY ALTERNATIVE NETWORK	
<u>Alternative</u>	<u>Route Mileage Required</u>
1	4.39
2	1.36
3	3.21
4	0

All alternatives include bike lane facilities along Sixth Street S.W. and across the First Avenue North Bridge. These highway construction projects have been planned to include bikeways as a part of their design.

2. Vehicular/bicyclist conflicts and avoidance of high volume auto traffic areas.

Table IV-3 gives an indication of the number of conflict areas between bicycle flows and motor vehicle flows. Of particular importance in this table is the total number of bikeway route miles along arterial streets required for alternative 4. It should be pointed out that a bike route or bike lane facility along an arterial street without access control generates a large number of auto-bike conflict points (e.g. intersections with driveways or entrances to parking lots). These conflict points do not appear directly in Table IV-3.

TABLE IV-3

VEHICULAR/BICYCLIST CONFLICTS, BY ALTERNATIVE NETWORK.			
<u>Alternative</u>	<u>Arterial Intersection Ratio (No. of Intersections with Arterial Streets /Total No. of Route Miles)</u>	<u>Bikeway Route Mileage* along Arterial Streets</u>	<u>Arterial Route Mileage Ratio (Route Mileage* along Arterial Sts/Total No. of Route Miles)</u>
1	0.93	1.14	0.12
2	1.38	3.79	0.17
3	1.17	10.65	0.23
4	1.31	26.36	0.63

* Excludes bike path route mileage

The data analysis in Table IV-3 must not be allowed to mislead the reader. In areas where no bikeways have been planned (as, for example, the Riverview section of the city in alternatives 1 and 2), no conflict areas have been recorded. The lack of a bikeway though, does not necessarily mean that conflict areas do not exist. In fact, the provision of a bikeway may serve to reduce conflict areas by channeling bicycling activity into a single facility. This should be taken into account in the interpretation of data in Table IV-3.

3. Accommodation of both internal neighborhood trips and longer distance "through" trips.

The bicyclist survey conducted in 1975 indicated that 17 origin destination zones in Great Falls accounted for 64% of the total number of bicycle trip ends which are within zones or to adjacent zones. Using the intrazonal and adjacent zone trips to represent "internal neighborhood trips," an attempt was made to evaluate the ability of each alternative to serve such trips by determining the total number of route miles within these 17 zones. Table IV-4 represents this data, indicating that alternatives 3 and 4 provide considerably more route mileage to the selected zones than the other two alternatives.

TABLE IV-4

BIKEWAY ROUTE MILEAGE WITHIN THE 17 ORIGIN-DESTINATION ZONES HAVING THE HIGHEST NUMBER OF NEIGHBORHOOD TRIPS

<u>Alternative</u>	<u>Route Mileage Within Designated O-D Zones</u>	<u>% of Total Route Mileage Within Designated O-D Zones</u>
1	0	0
2	5.50	25.2
3	13.57	30.0
4	14.63	34.7

Accommodation of longer distance trips is best judged on the basis of overall travel time between various points in the urban area or network travel speeds. In the absence of data regarding these factors and prior to implementation of any bikeways in the urban area, it would appear impossible at this point to make realistic estimates. Generally one might expect alternative 4 to provide the fastest overall travel time for utility trips, followed by alternative 3, then 2, and finally alternative 1. No factual data is available with which to test this speculation, however.

4. Access to major bike trip generators such as schools, parks, libraries and shopping centers.

Table IV-5 indicates the ability of each alternative network to provide access to major generators of bicycle trips in the urban area. The percentages expressed in Table IV-5 are based on a total of 83 major bike trip generators, comprised of 35 schools, 45 parks, 1 public library and 2 major shopping centers.

Table IV-5 indicates that alternative 3 and 4 are very similar in their ability to serve major bicycle trip generators, and that both 3 and 4 serve these generators better than alternatives 1 and 2.

TABLE IV-5

ACCESS PROVIDED TO GREAT FALLS AREA		
MAJOR BIKE TRIP GENERATORS		
(SCHOOLS, PARKS, LIBRARIES AND SHOPPING CENTERS) BY ALTERNATIVES		
<u>Alternative</u>	<u>Percent of Major Generators Within 1 Block of a Bikeway.</u>	<u>Percent of Major Generators Within 3 Blocks of a Bikeway</u>
1	7.2	7.2
2	41.0	55.4
3	57.8	75.9
4	62.7	79.5

5. Accommodation of both recreation-oriented and utility-oriented trips.

No quantifiable measure was found for this criterion. What is desired is a balance between the bikeway network's ability to accommodate both utility-oriented trips (which are best served by continuous routes with as few mandatory stops and street grades as possible) and recreation-oriented trips (which are best served by facilities which are as free as possible of motor vehicle traffic).

An evaluation of the four alternatives by the staff showed that alternative 1, designed to accommodate primarily recreational bicyclists, and alternative 4, which stresses utility bike trips by using major highway facilities, do not meet this criterion. Alternatives 2 and 3, featuring some bike path facilities and using local streets and collectors where possible, provide the compromise necessary to meet this criterion.

6. Provide convenient access to the network from any residential neighborhood in the urbanized area.

Figures IV-1 through IV-4 are service area maps showing locations within four blocks of a bikeway facility.

As one might expect, neighborhood accessibility is closely related to the total route mileage of a network. The service areas for alternatives 3 and 4 are thus very similar; the maps for alternatives 1 and 2 indicate a number of areas which are far from any bikeway due to the smaller amount of bikeway route mileage.

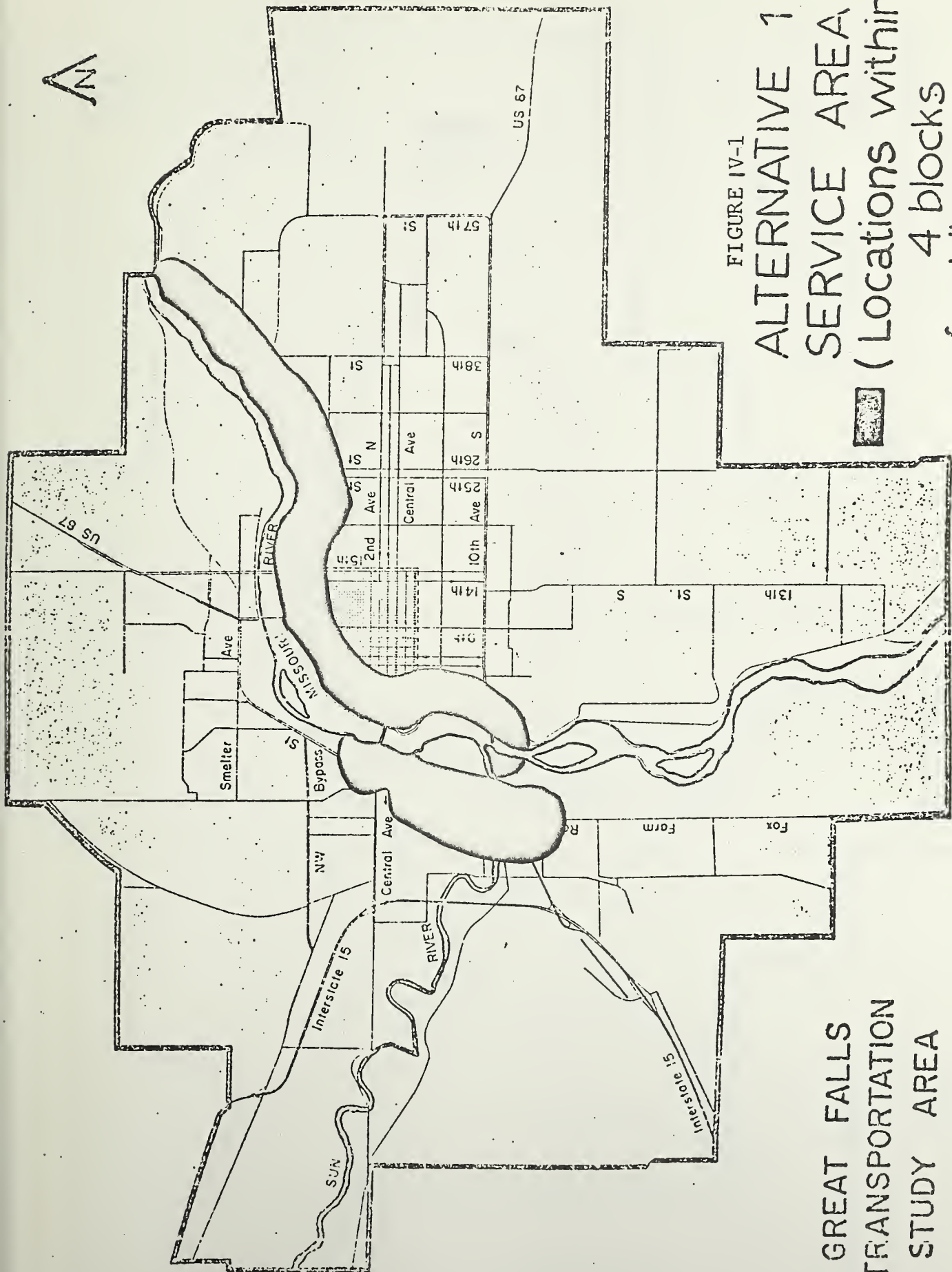


FIGURE IV-1

ALTERNATIVE 1

SERVICE AREA

(Locations within

4 blocks

of a bikeway facility

GREAT FALLS
TRANSPORTATION
STUDY AREA

A

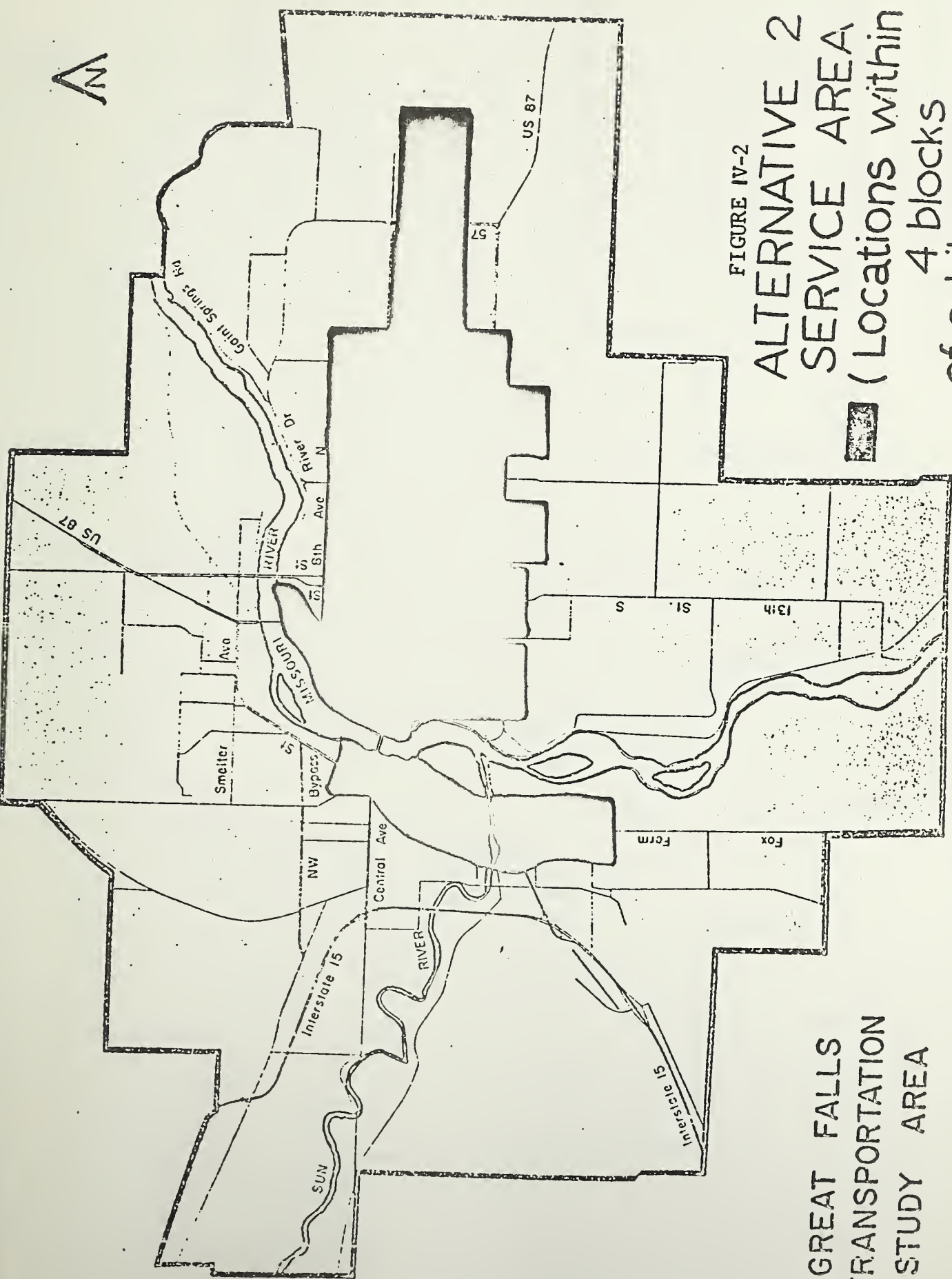


FIGURE IV-2
ALTERNATIVE 2
SERVICE AREA
 (Locations within
 4 blocks
 of a bikeway facility)

GREAT FALLS
 TRANSPORTATION
 STUDY AREA

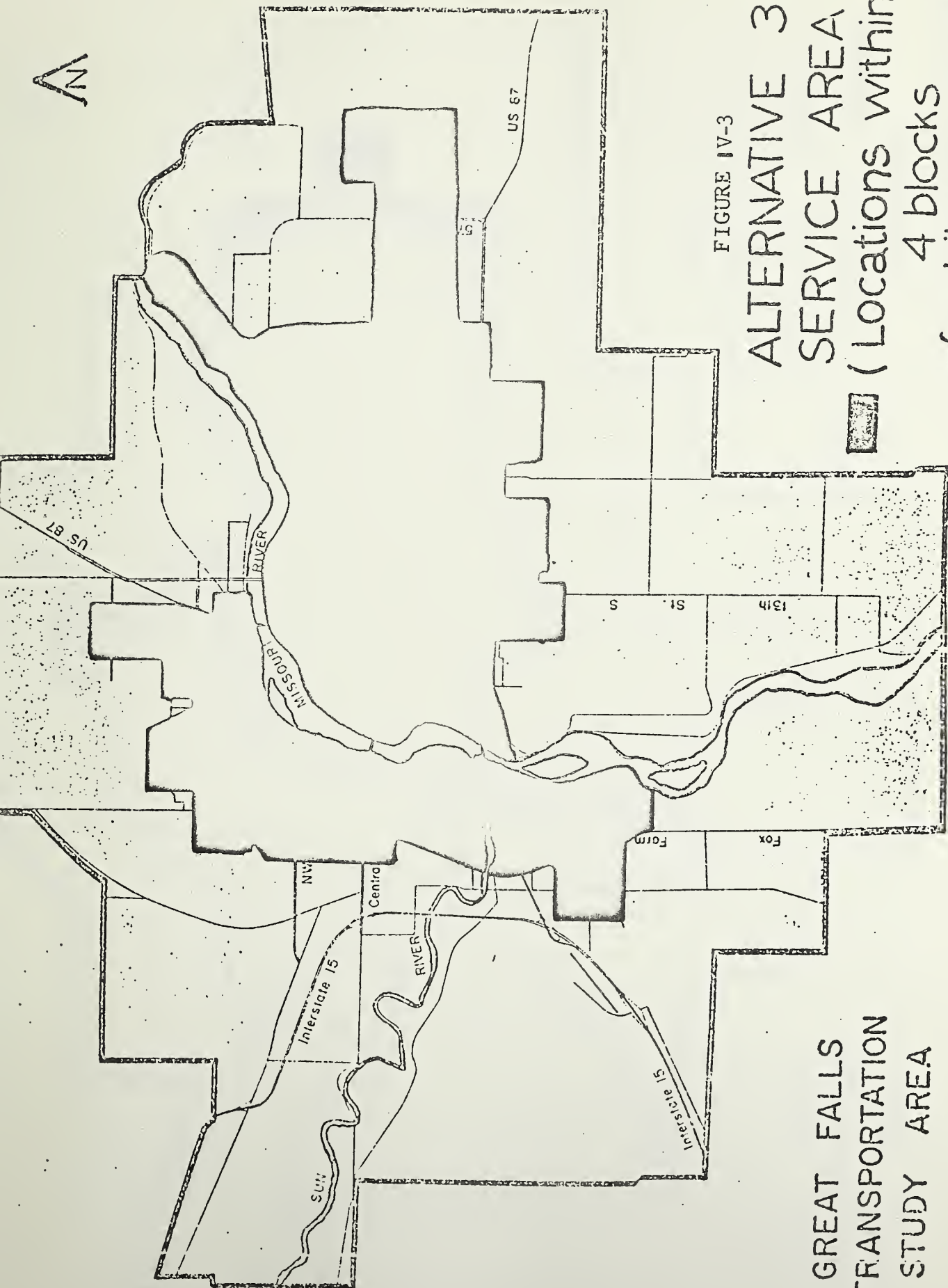


FIGURE IV-3

ALTERNATIVE 3 SERVICE AREA

(Locations within
4 blocks
of a bikeway facility)

GREAT FALLS
TRANSPORTATION
STUDY AREA

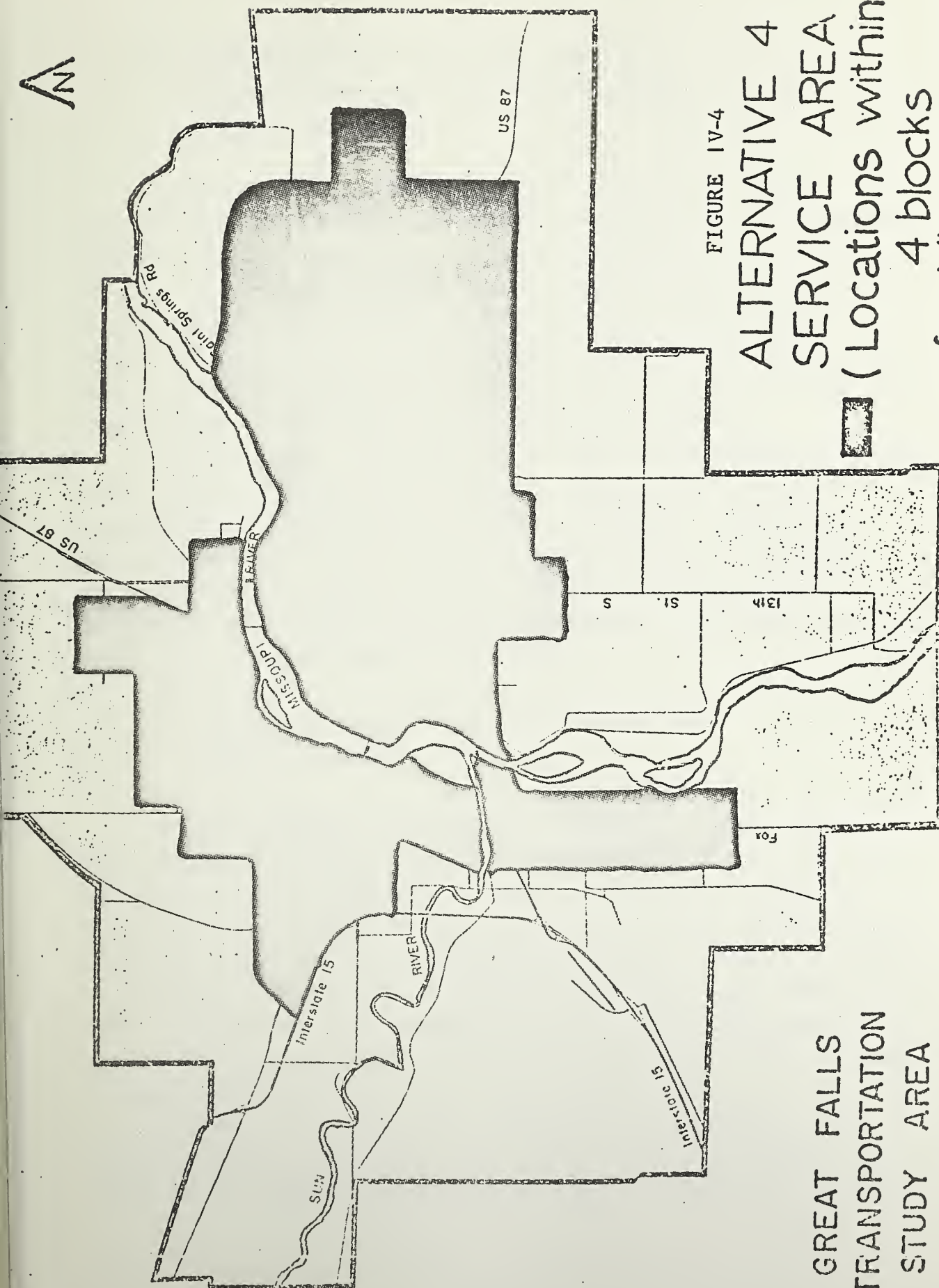


FIGURE IV-4

ALTERNATIVE 4 SERVICE AREA

(Locations within
4 blocks
of a bikeway facility)

GREAT FALLS
TRANSPORTATION
STUDY AREA

7. Comprehensive, long-range system to serve current and future anticipated bikeway needs.

Planning is necessarily oriented toward the future. In transportation planning, a twenty to twenty-five year planning horizon is typically used. It is the opinion of the authors of this bikeway plan that a similar horizon ought to be used in the planning of bicycle facilities, and that the plan should be comprehensive and complete. The extent of the plan may be limited by financial or other practical constraints but not by lack of foresight or imagination by planners.

On this basis, alternatives 3 and 4 are preferable to the more limited alternatives 1 and 2. Alternatives 3 and 4 provide for a comprehensive system of bikeways throughout the developed portions of the urban area and opportunities for convenient extension of the network in future years. Section V provides detailed information regarding costs and staging for one of these alternatives.

8. Minimize right-of-way acquisition and overall costs.

The four bikeway alternatives proposed in this report were designed in such a way as to require as little right-of-way acquisition as possible. Only alternative 3 requires the construction of bicycling facilities on land which is now privately owned and not dedicated as either a street or a park. The facility involved is a strip of land less than 1500 feet long belonging to the Meadowlark Country Club. The possibility exists that an easement could be obtained rather than acquisition of right-of-way.

A number of sources were consulted in estimating unit bikeway construction costs. The most realistic estimate was found in the Comprehensive Bikeway Plan for Billings, Montana,

from which cost estimates were taken. The guideline costs given in Table IV-6 include anticipated design fees, construction of the facility, signing and striping. The figures should be used only for general estimating purposes.

TABLE IV-6

UNIT COST GUIDELINES FOR BIKEWAYS	
Bike Paths	\$40,000-\$50,000/mile
Bike Lanes	
With Parking	\$ 6,000-\$ 8,000/mile
Parking Removed	\$ 8,000-\$10,000/mile
Bike Routes	\$ 3,000-\$ 4,000/mile

It should be emphasized that these costs do not include provisions for major structures such as bikeway overpasses or underpasses or land acquisition costs.

Total construction cost estimates and cost estimates per route mile for each alternative are indicated in Table IV-7. It should be noted that bikeway costs along three major highway projects (6th Street SW, First Avenue North Bridge and Warden Bridge) which have bikeways incorporated into the design and the bike path in Gibson Park (which currently exists) have not been included in these estimates.

TABLE IV-7

CONSTRUCTION COSTS BY ALTERNATIVE		
Alternative	Total Const. Cost (Est.)	Const. Cost/Route Mile
1	\$202,310	\$35,134
2	129,800	7.054
3	327,600	7,112
4	243,675	6,194

Comparison Summary:

All eight evaluation criteria were taken into account in selecting one of the alternatives to be the recommended network. For each specific evaluation criteria a value of 1-4 was assigned to each network alternative to indicate the relationship of that alternative to the other alternatives in satisfying the specific criteria. Table IV-8 summarizes the results of this evaluation process.

TABLE IV-8
Results of Alternative Bikeway Network Comparison

Evaluation Criteria Ref. No.	Specific Evaluation Criteria	Alternative			
		1	2	3	4
		<u>Rank</u>	<u>Rank</u>	<u>Rank</u>	<u>Rank</u>
	<u>Table IV-2 Bikepath Construction Requirements</u>				
1	- The network which required the least number of miles of new bikepath construction was considered the most desirable.	4	2	3	1
	<u>Table IV-3 Vehicular/Bicyclist Conflicts</u>				
2	- The network having the least number of route miles intersecting arterial streets was considered the most desirable.	<u>1</u>	<u>4</u>	<u>2</u>	<u>3</u>
	- The network having the least number of route miles along arterial streets was considered the most desirable.	1	2	3	4
	<u>Table IV-4 Bikeway Route Mileage Within the 17 Origin-Destination Zones Having the Highest Number of Neighborhood Trips</u>				
3	- The network having the highest % of total route miles within the designated O-D zones was considered the most desirable.	4	3	2	1
	<u>Table IV-5 Access Provided to Great Falls Area Major Bike Trip Generators</u>				
4	- The network having the highest % of major generators within 1 & 3 Blocks of a bikeway was considered the most desirable.	4	3	2	1

Table IV-8 continued

Evaluation Criteria Ref. No.	Specific Evaluation Criteria	Alternative			
		1	2	3	4
		<u>Rank</u>	<u>Rank</u>	<u>Rank</u>	<u>Rank</u>
5	- No quantifiable measure was found for this criterion. However, the network which provided a balance between both utility-oriented trips and recreation-oriented trips was considered the most desirable.	4	2	1	3
6	<u>Figures IV-1 - IV-4 Service Area Maps Showing Locations Within 4 Blocks of a Bikeway Facility</u> - The network which had the largest service area was considered the most desirable.	4	3	2	1
7	- The network which provided for a comprehensive system of bikeways and the opportunities for future extension was considered the most desirable.	4	3	1	2
8	<u>Table IV-8 Construction Costs</u> - The network having the lowest construction cost per route mile was considered the most desirable	4	2	3	1

Based upon the results of the evaluation criteria and other immeasurable factors and indicators, Alternative No. 3 was selected as the recommended network.

Briefly, the network is more desirable because it accommodates both recreation and utility oriented trips, and short neighborhood trips as well as longer distance commuting trips. The network separates major bicycling and auto facilities where possible, as a means of promoting bicycling safety, and serves a high percentage of neighborhoods and major bicycle trip generators in the urban area. The recommended network is described in more detail in Appendix A.

The one alternative which has not been considered in the comparison so far is Alternative No. 5, the "no build" alternate. The point in question is whether there is any need for bicycling facilities in Great Falls. The need for bikeways must be weighed against other community needs such as streets and highways, housing, public transit or a multi-purpose center.

The bicyclist survey conducted in Great Falls revealed a total of 4,904 bicyclists in 9.4 percent of the total population, comprising 63.8 percent of all persons surveyed. These bicyclists make over 32,000 bicycle trips in an average week and most, according to the survey, would use bikeways if provided (see Table II-1, Question 9).

From a transportation standpoint, no form of transportation (besides walking) is cleaner, cheaper or more beneficial to physical fitness than the bicycle. Recreationally, the bicycle is enjoyable and relaxing. Indisputably, it is a very economical form of transportation which is well suited to urban areas.

A bikeway system, as noted in Table IV-7, is relatively inexpensive to construct when compared to a public transit system or a multi-purpose sports complex. Bikeways would be used and enjoyed by a broad cross-section of the urban area population. The bicycle is a popular form of transportation which should be included in a comprehensive transportation plan. For all these reasons, Alternative 3 is recommended over Alternative 5, the "no build" alternate.

V. FUNDING AND PROJECT STAGING:

The benefits of a comprehensive bikeway network can only be enjoyed after implementation of a bikeway plan, which is highly dependent upon adequate funding. This section explores potential bikeway funding sources and proposes a staging plan for bikeway construction.

Funding Sources:

A number of funding sources for bikeways have been investigated. The following paragraphs outline current sources of funds for bikeways and potential sources for the future:

1. Federal and State highway funding:

Section 217 of Title 23 of the United States Code, related to highways, stipulates that a State "may, on Federal-aid highway projects, include to the extent practicable, suitable, and feasible, the construction of separate or preferential bicycle lanes or paths." No State may obligate more than \$2,000,000 for such projects in any fiscal year. To qualify for Federal-aid highway funding, a project must be located on either the Urban or Urban-Extension highway systems.

Action by the Montana State Legislature in 1975 (R.C.M. 32-2626 and 32-2627, also known as House Bill 161) stipulated that no less than "three-quarters of one percent of the amount appropriated to the department of highways from the earmarked revenue fund for the construction program, maintenance program, and preconstruction program" is to be spent towards the establishment of footpaths and bicycle trails.

There is presently some debate statewide in regard to the allocation of these monies and the implications of bikeway funding upon highway construction funding levels. As a result no monies have yet been allocated for bikeway projects.

The present annual State allocation for highway construction in the Great Falls Urban Transportation Study Area is approximately \$339,700. Application of the three-quarters of one percent funding ratio to this allocation yields an annual allocation of approximately \$2,548 for bikeway construction. If these monies were used to match Federal-Aid Highway funds (using the present Federal-State funding ratio of approximately 74-26), a minimum annual allocation of approximately \$9,785 would result.

2. Federal Revenue Sharing:

A total of \$10,000 in Federal revenue sharing funds was appropriated in the 1975-76 budget for the City of Great Falls for bikeway construction. Approximately \$9,800 of this appropriation remains unspent and is available for bikeway development. There is a possibility that future revenue sharing funds could be used for bikeway construction, particularly if initial trials with bikeways show that they are popular and widely used.

3. Bureau of Outdoor Recreation Funds:

Bikeways are eligible for funding from the Bureau of Outdoor Recreation (BOR), the funds of which are administered in Montana by the State Fish and Game Commission. Funds for the 1976-77 fiscal year have already been allocated, but the possibility exists that funds for bikeways may be available in future years. BOR funds are programmed project-by-project on an as-needed basis.

4. City General Fund:

Funds for bikeway development could be obtained from the City general fund.

5. Highway Safety Funds:

Section 402 of Title 23 of the United States Code indicates that each State shall have a highway safety program including uniform standards to (among other things) improve pedestrian performance and bicycle safety. Bikeway projects are eligible for funding under this section of the code, but only insofar as accident records or other information indicates that a safety hazard is present.

6. Private funds:

Private funding and donations are other possibilities for bikeway funding. Private monies may be used to provide matching funds for Federal programs.

Revenue Estimates:

Though bikeways qualify for funds from a great variety of funding sources, the mechanisms for funding of bikeways through these sources are not well developed. Of the funding sources mentioned in the previous section, only the \$10,000 revenue sharing funds have been specifically allocated to bikeways. One difficulty in regard to funding is that no plan for bikeways has previously

existed in Great Falls. Funding of bikeways from highway monies is contingent upon the existence of a plan for bikeway development.

In the project staging plan which follows, a funding estimate of \$80,000 per five year period, or approximately \$16,000 per year, has been made. It is suggested at this point that approximately \$10,000 annually be allocated from the minor highway ("TOPICS-type") project allocation in Great Falls for bikeway development. This funding is consistent with both the intent and the letter of R.C.M. 32-2626 and 32-2627 and establishes a solid financial base for future bikeway development in Great Falls.

It is further suggested that the Great Falls City Commission consider allocating money (a minimum of \$6,000 is suggested) annually for bikeway construction from revenue-sharing funds.

Project Staging:

The development of the bikeway network has been organized into four staging periods, covering a time span of 1976-1995, with funding estimated at \$16,000 per year. All costs and funding levels are estimated in 1976 dollars. Table V-1 indicates the proposed project staging, and figures V-1 through V-4 illustrate each staging period.

Other Possibilities:

During the preparation of this plan, the bikeway network has not been prepared without consideration of other planning efforts currently underway in Great Falls or in the formative stages at this time. Other plans and events may have a substantial effect on the form of the bikeway network, and are mentioned here for future consideration.

The Park and Recreation Board of the City of Great Falls has plans to develop the west bank of the Missouri River into a riverfront park between approximately First Avenue North and Tenth Street North. Inclusion of a bike path in this park would be desirable and would probably permit elimination of the planned bike lane on 3rd Street Northwest. As plans for the park develop, the inclusion of a bike path within the park is recommended.

There has been some discussion regarding the possibility of creating an auto restricted zone (a pedestrian mall) in the CBD area of Great Falls. If and when such a concept reaches the planning stage, the provision of bikeway facilities in the project design should be considered. This would make possible the use of Central Avenue for a bikeway from the CBD to 44th Street, rather than 1st and 2nd Avenue South as is presently planned.

A third possibility is that through railroad relocation or consolidation efforts, either the Milwaukee Railroad bridge across the Missouri River near First Avenue North or the Burlington Northern Railroad tracks along the south bank of the Missouri River could be abandoned. Either of these facilities would be well suited to bikeways and should be considered if future events make this possible.

The existing transportation plan for Great Falls includes highway projects to improve River Drive between 6th Street North and Giant Springs Road. Much of River Drive in this area is narrow, hilly and generally hazardous for bicyclists, while at the same time, it is a very desirable location for a bicycling facility. It is recommended that the design for any improvements of River Drive incorporate the provision of a separate bike path, if possible, between 10th Street North and Giant Springs Road. The incorporation of bike paths into the design of the Northwest Bypass Bridge (currently a part of the Great Falls Transportation Plan) should be considered also.

Finally, there is some question regarding the life expectancy of the Tenth Street Bridge in Great Falls and the need for this span upon construction of a bridge across the Missouri at the Northwest Bypass. If at any time the bridge is found to be either unnecessary or unsuitable for auto traffic, it would be well to examine the potential of the bridge as a facility for pedestrian and bicycle use.

TABLE V-1

BIKEWAY PROJECT STAGING
GREAT FALLS, MONTANA

Ref.* No.	Bikeway Link	From	To	Cost**
Staging Period 1 (1976-1980)				
15	4th Avenue No.	Gibson Park -	38th St. No.	\$10,000
3	1st & 2nd Ave. So. One Way Couplet	4th St. So. -	15th St. So.	6,300
1	River Drive	10th Ave. So.-	1st Ave. No.	44,000
18	20th St. incl. connection to 9th St. So.	8th Ave. No.-	Vo-Tech	10,000
21	2nd Ave. South	15th St. So.-	38th St. So.	6,500
22	3rd Ave. South	38th St. So.-	MAFB	7,500
7	3rd St. S.W., 6th St. S.W., Fox Farm Road	Cent.Ave. W.-	18th St. S.W.	---
12	1st Ave. No.	West Bank of	-Park Drive Missouri Riv.	---
Total Staging Period 1 Cost:				\$84,300
Staging Period 2 (1981-1985)				
1	River Drive	1st Ave. No. -	10th St. No.	\$53,000
2	Gibson Park Loop incl. connection to River Dr. & Bikepath	Within Gibson &	River Parks	4,000
29	River Dr. & Giant Springs Road	10th St. No. -	Giant Springs Park	11,900
11	Cent. Ave. West	9th St. N.W. -	1st Ave. No. Bridge	3,700
10	10th St. Bridge	Smelter Ave.-	River Drive	1,000
Total Staging Period 2 Cost:				\$78,600

** 1976 Estimates

Table V-1 (Continued)

Ref.* No.	Bikeway Link	From	To	Cost**
Staging Period 3 (1985-1990)				
14	8th Ave. So.	2nd St. So. -	38th St. So.	\$17,500
6	8th Ave. No. incl. connection to River Drive Bikepath	5th St. No. -	38th St. No.	19,000
4	25th & 26th St. One Way Couplet	River Drive -	3rd Ave. So.	10,000
20	9th Street	8th Ave. No.-	13th Ave. So.	11,200
9	Smelter Ave.	6th St. N.W. -	10th St. No.	11,000
8	3rd St. N.W.	Smelter Ave.-	Cent. Ave. W.	10,400
17	4th Street	4th Ave. No.-	8th Ave. So.	3,200
16	Central Avenue	Park Drive -	4th Street	800
Total Staging Period 3 Cost:				\$83,100
Staging Period 4 (1990-1995)				
5	38th Street	8th Ave. No.-	8th Ave. So.	\$11,000
13	10th Ave. South	2nd St. So. -	Meadowlark Dr.	13,000
19	32nd Street	8th Ave. No.-	Chas. Russell Park	6,300
23	Meadowlark Dr., Alder Dr., Coyote Lane	Meadowlark - Country Club	Fox Farm Addn.	4,000
24	9th St. N.W. & other Streets	Cent. Ave. W.-	CMR High Sch.	3,700
25	14th St. N.W.	CMR Hi Sch. -	3rd St. N.W.	1,900
26	Division Road	3rd St. N.W.-	Riverview Dr.	5,200
27	6th St. N.E., 25th Ave. N.E., 8th St. N.E., 9th St. N.E.	Smelter Ave.-	36th Ave. N.E.	4,500
28	38th St. - N.E. Bypass	8th Ave. No.-	River Drive	32,000
Total Staging Period 4 Cost:				\$81,600
Total 20-Year Cost:				\$327,600

* Numbers refer to Projects listed in Appendix A.

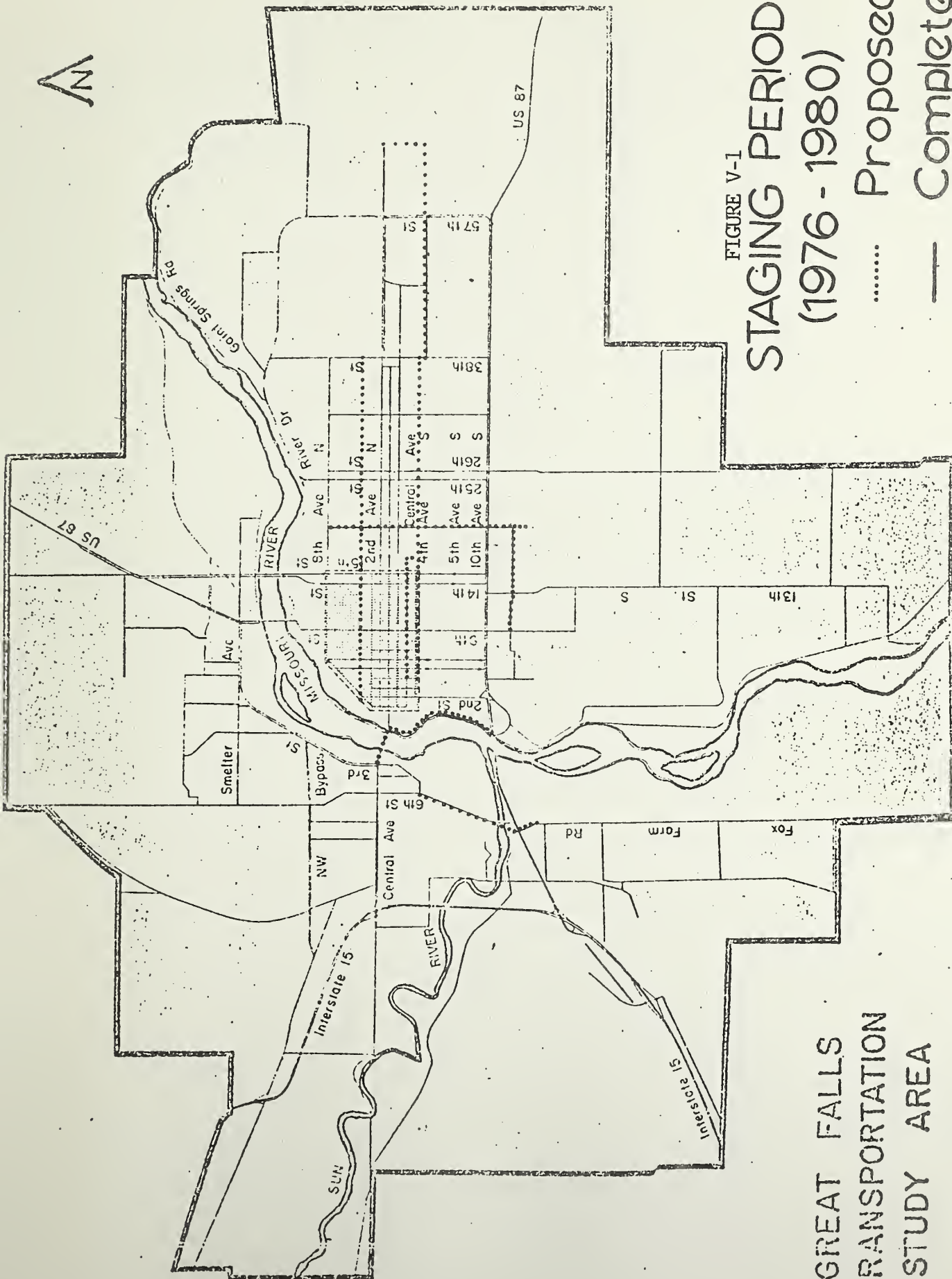


FIGURE V-1
STAGING PERIOD 1
 (1976 - 1980)
 Proposed
 — Completed

GREAT FALLS
 TRANSPORTATION
 STUDY AREA

A

US 87
 Smelter Ave
 Bypass St
 Central Ave
 NW
 SUN
 Missouri RIVER
 River Dr
 Central Ave
 4th Ave
 5th Ave
 10th Ave
 13th St
 14th St
 9th St
 2nd St
 6th St
 8th Ave
 2nd Ave
 57th St
 38th St
 26th St
 25th Ave
 1st St
 US 87
 Fox Rd
 Form Rd
 Interstate 15
 Interstate 15

FIGURE V-2
 STAGING PERIOD
 (1981-1985)
 Proposed
 — Completed

GREAT FALLS
 TRANSPORTATION
 STUDY AREA

FIGURE V-2
STAGING PERIOD 2
(1981-1985)

Proposed	Completed
.....	—

GREAT FALLS TRANSPORTATION STUDY AREA

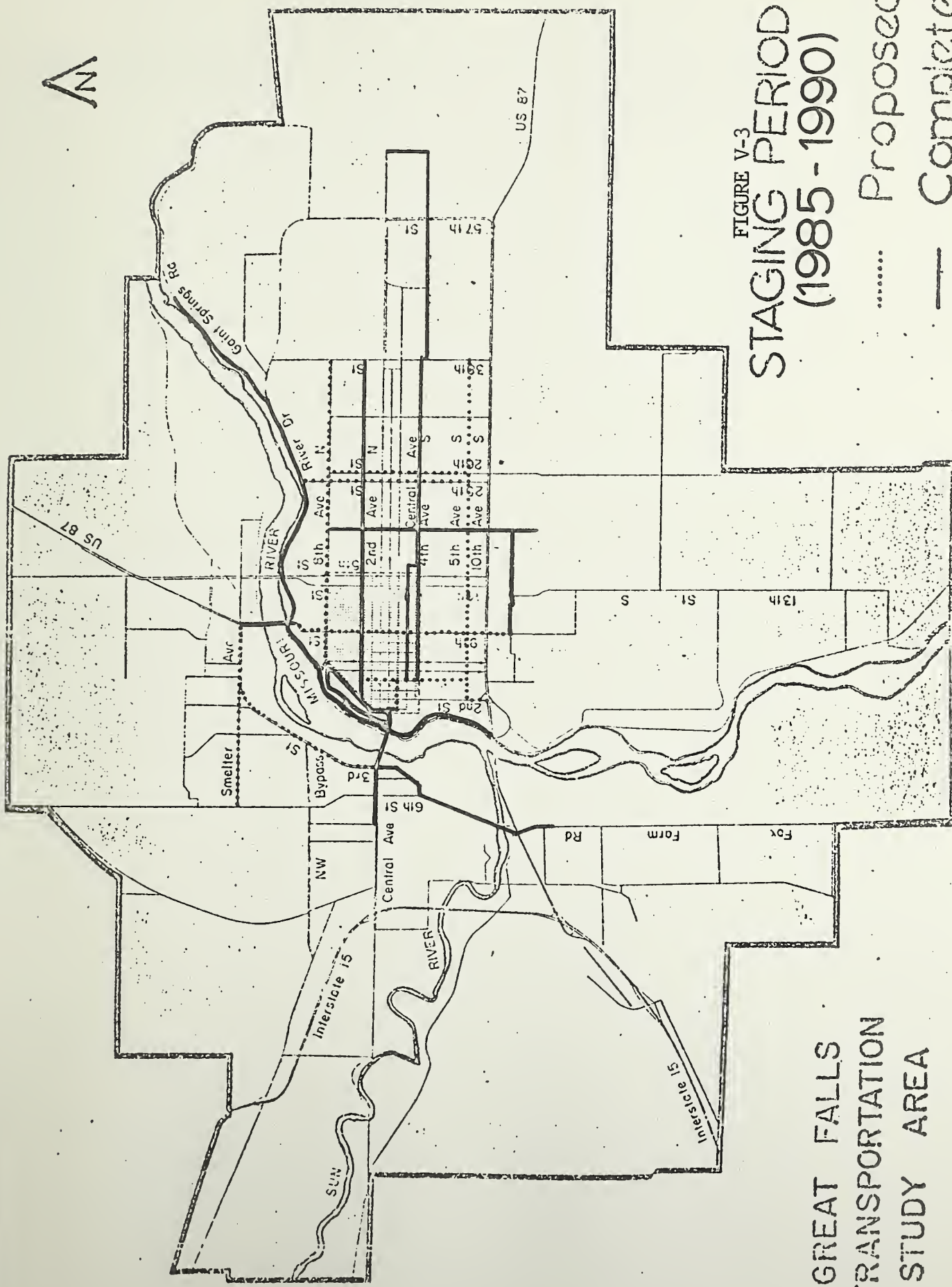


FIGURE V-3
STAGING PERIOD 3
(1985-1990)

GREAT FALLS
TRANSPORTATION
STUDY AREA

A

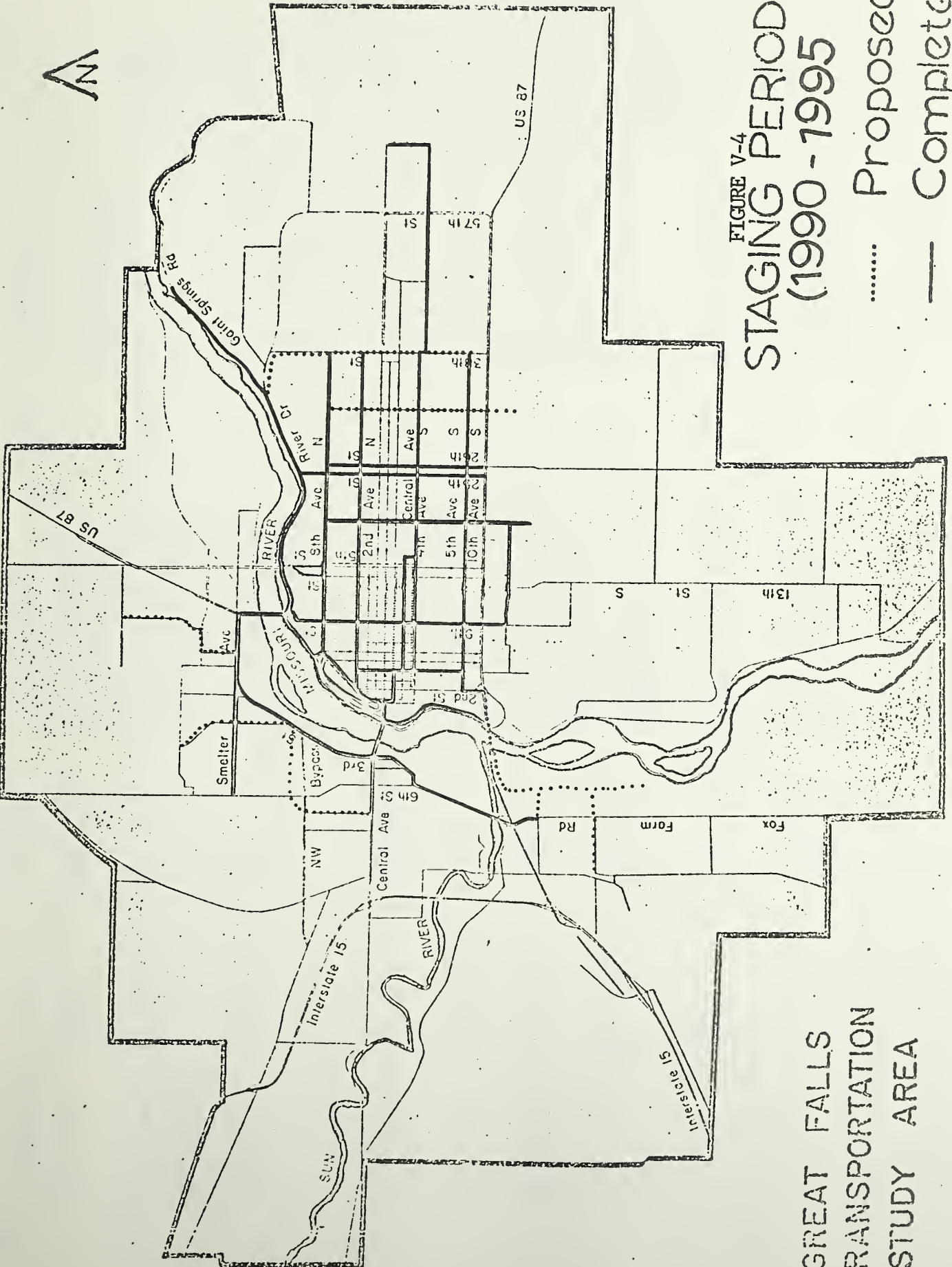


FIGURE V-4
STAGING PERIOD 4
(1990 - 1995)

..... Proposed
— Completed

GREAT FALLS
TRANSPORTATION
STUDY AREA

APPENDIX A
RECOMMENDED NETWORK
Alternative 3

Ref. No.	Bikeway Link	From - To	Present Street Classification & ADT	Street Description; Design Problems	Bikeway Length	Bikeway Type & Details	Cost
1	River Drive	10th Ave. So. to 15th St. No.	Minor Arterial 1600-3100 ADT	60 ft. ROW; bordered by dedicated park land; poor lateral clearance at 3 locations; no parking	2.27 mi.	Bike Path; Bike Lane with barrier curbs at R.R. and bikeway underpasses, overpass	\$102,000
2	Gibson Park Loop Including Connection to River Dr. Bike Path	Within Gibson & River Parks	Vacated local	26(?) ft. surface width; Pedestrian walkway under railroad tracks with approx. 6 ft. vertical clearance	1.43 mi.	Bike Path	4,000
3	1st & 2nd Ave. So. One-way couplet	4th St. So. to 15th St. So.	Local 2 Ave. So-3200ADT 1 Ave. So-4000ADT	80 ft. ROW; One-way auto traffic; Ramp from parking garage on 1st Ave. So.; parking both sides; curb & gutter; narrow pavement	0.90 mi.	Bike Lane on left side of 1st Ave. So., on right side of 2nd Ave. So.; one lane of parking to be removed on 2nd Ave. So. (7th St.-15th St.) and 1st Ave. So. (10th St.-15th St.)	6,300
4	25th & 26th St. One-way couplet	River Drive to 8th Ave. So.	Minor Arterial 2700-4600 ADT each	80 ft. ROW; parking on right side only; curb & gutter	1.43 mi.	Bike Lane between parking lane & driving lane on right	10,000
5	38th Street	8th Ave. No. to 8th Ave. So.	Collector 4000 ADT	80 ft. ROW; 35 ft. pavement width; curb & gutter; parking both sides	1.21 mi.	Bike Lane along curb; parking removed	11,000
6	8th Ave. No. incl. connection to River Dr. Bike Path	5th St. No. to 38th St. No.	Collector 1400-3200 ADT	80 ft. ROW; 45 ft. pavement width; curb & gutter; parking both sides; poor lateral clearance on 6th St. No.	2.71 mi.	Bike Lane between parking lane & driving lane; Barrier curb at R.R. underpass	19,000
7	3rd St. S.W., 6th St. S.W., Fox Farm Road	Cent. Ave. W. to 18th Ave. S.W.	Minor Arterial 6000-7500 ADT	Highway reconstruction project committed, to include combined sidewalk-bike path	1.66 mi.	Bike Path combined with sidewalk	Included in costs of highway project
8	3rd St. N.W.	Snelter Ave. to Cent. Ave. West	Principal Arterial 9600-13,200 ADT	Over 100 ft. ROW; wide paved emergency lane on shoulder	1.48 mi.	Bike Lane using highway emergency parking lane	10,400
9	Snelter Ave.	6th St. N.W. to 10th St. No.	Collector and Principal Arterial 2300-142,00 ADT	80 ft. ROW; collector portion; Over 100 ft. ROW; Arterial portion; wide paved emergency lane on shoulder	1.58 mi.	Bike Lane using highway emergency parking lane or lane alongside auto parking lane	\$ 11,000
10	10th St. Bridge	Snelter Ave. to River Drive	Minor Arterial 8400 ADT	24 ft. roadway width; 7 1/2 ft. sidewalks on either side	0.45 mi.	Bike Lane on sidewalks	1,000
11	Cent. Ave. West	9th St. N.W. to 1st Ave. No. bridge	Principal Arterial 17,000 ADT	Over 48 ft. pavement width; parking both sides; curb & gutter; existing roadway congested	0.53 mi.	Bike Lanes; may require revision of traffic flow in area	3,700

APPENDIX A
RECOMMENDED NETWORK
Alternative 3

Ref. No.	Bikeway Link	From - To	Present Street Classification & ADT	Street Description; Design Problems	Bikeway Length	Bikeway Type & Details	Cost
12	1st Ave. North	West bank of Missouri River to Park Drive	Principal Arterial 23,000 ADT	Bridge reconstruction project planned including sidewalk-bikepath; pedestrian walkways at R.R. underpass now used by bicyclists	0.38 mi.	Bike Path combined with sidewalk	Included in costs of highway project
13	10th Ave. South	2nd St. to Meadowlark Dr.	Principal Arterial 15,700 ADT	Bridge addition planned including sidewalk-bikepath	0.48 mi.	Bike Path combined with sidewalk; may require easement or ROW	13,000
14	8th Ave. South	2nd St. So. to 38th St. South	Local	80 ft. ROW; street interrupted by two parks; parking both sides; curb & gutter	3.12 mi.	Bike Route; to be routed around the two parks using other streets	17,500
15	4th Ave. North	Gibson Park to 38th St. No.	Local	80 ft. ROW; parking both sides; curb & gutter	2.87 mi.	Bike Route	10,000
16	Central Avenue	Park Dr. to 4th Street	Collector 7700 ADT	90 ft. ROW; parking both sides; curb & gutter, CBD	0.24 mi.	Bike Route	800
17	4th Street	4th Ave. No. to 8th Ave. South	Local	80 ft. ROW; parking both sides; curb & gutter, CBD	0.90 mi.	Bike Route	3,200
18	20th St. Including connection to 9th St. South	8th Ave. No. to 9th St. South	Local 700-2200 ADT	80 ft. ROW; parking both sides; curb & gutter	2.84 mi.	Bike Route	10,000
19	32nd Street	8th Ave. No. to Charles Russell Park	Collector 400-2000 ADT	80 ft. ROW; parking both sides; curb & gutter	1.81 mi.	Bike Route	\$ 6,300
20	9th Street	8th Ave. No. to 13th Ave. So.	Minor Arterial 4800-8900 ADT	80 ft. ROW; no parking btm 2nd Ave. No. & 2nd Ave. So; curb & gutter	1.60 mi.	Bike Lane	11,200
21	2nd Ave. South	15th St. So. to 38th St. So.	Local	80 ft. ROW; parking both sides; curb & gutter	1.85 mi.	Bike Route	6,500
22	3rd Ave. South	38th St. So. to MAFB	Local & Collector	80-100 ft. ROW; Frontage Rd. along part of road; City improvement project planned	2.11 mi.	Bike Route	7,500
23	Meadowlark Dr., Alder Dr., Coyote Lane	Meadowlark C.C. to Fox Farm Addn	Local	Local streets, parking both sides	1.58 mi.	Bike Route	4,000
24	9th St. NW and other Sts.	Central Ave. W. to C.R. High Sch.	Local	60 ft. ROW; parking both sides	1.06 mi.	Bike Route	3,700

APPENDIX A
RECOMMENDED NETWORK
Alternative 3

Ref. No.	Bikeway Link	From - To	Present Street Classification & ADT	Street Description; Design Problems	Bikeway Length	Bikeway Type & Details	Cost
25	14th Ave. NW	CMR High School 3rd St. NW	None	Local street planned	0.53 mi.	Bike Route	1,900
26	Division Road	3rd St. NW to Riverview Dr.	Collector 1600-3200 ADT	80 ft. ROW; parking both sides No. of Smelter Ave; curb & gutter	0.90 mi.	Bike Lane So. of Smelter Ave.; Bike Route No. of Smelter Ave.	5,200
27	6th St. NW, 25th Ave. NE, 8th St. NE, 9th St. NE	Smelter Ave. to 36th Ave. NE	Local & Collector	80 ft. ROW; parking both sides; curb & gutter	1.28 mi.	Bike Route	4,500
28	38th St. - NE Bypass	8th Ave. No. to River Dr.	Minor Arterial 1600-3900 ADT	Over 100 ft. ROW; no parking	0.71 mi.	Bike Path in park land	32,000
29	River Dr. & Giant Springs Rd.	15th St. No. to Giant Springs Park	Minor Arterial & Collector 5500-8200 ADT	over 100 ft. ROW; narrow (25-30ft.) pavement width; steep grade; steep cliffs	3.40 mi.	Bike Route (possibly Bike Path in proposed Lewis & Clark St. Park)	11,900
							\$327,600

APPENDIX B

BIKEWAY SURVEY TRIP TABLES

O-D ZONE CENTROID NUMBERS

O-D ZONE CENTROID NUMBERS

